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A TEXT BOOK OF MEDICINE

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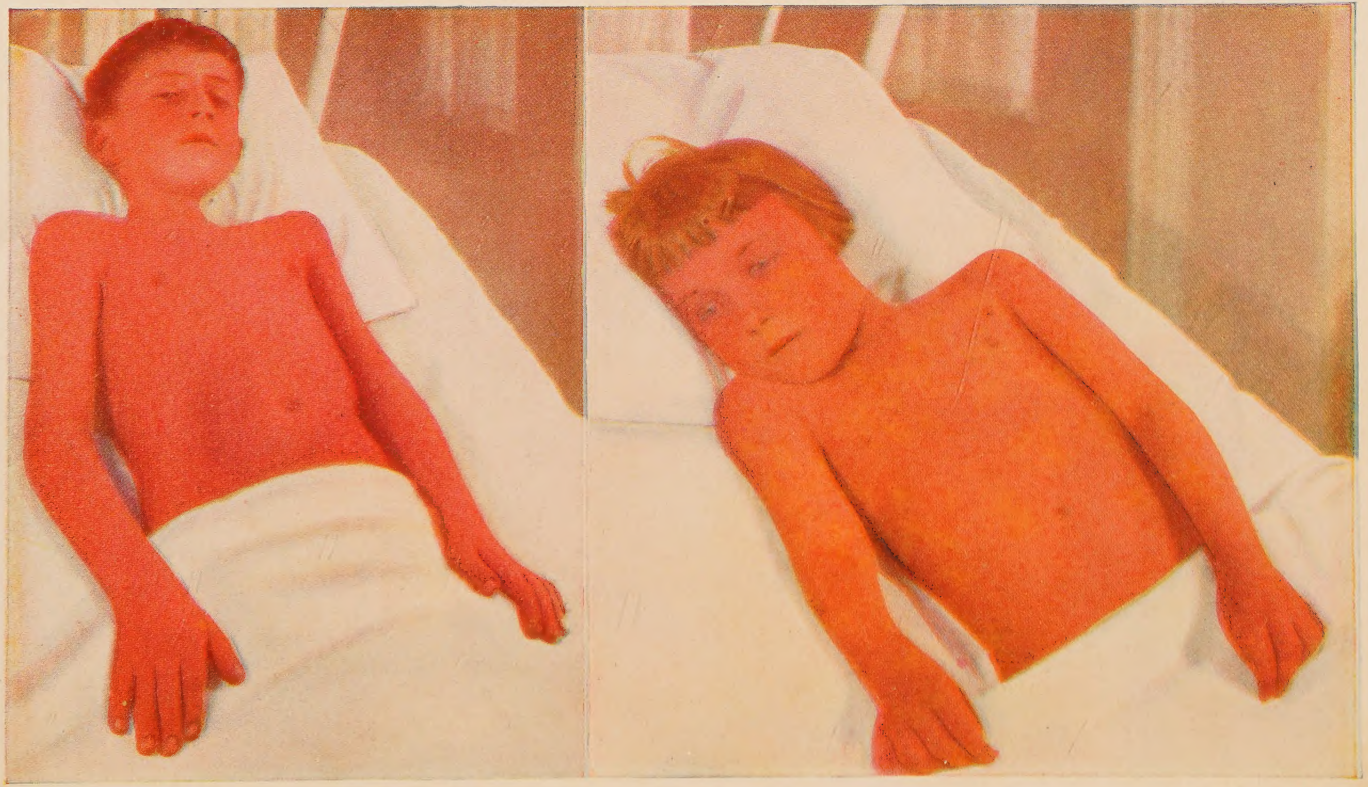

SCARLET FEVER ERUPTION.

MEASLES ERUPTION.

A TEXT BOOK OF MEDICINE

For Students in Schools of Nursing

BY

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TO

MY MOTHER

PREFACE

The object of this book is to instruct nurses in the essential facts of internal medicine from the clinical and nursing aspect. It is essentially a teaching book and aims to present the subject in a simple, clear, yet comprehensive manner, emphasizing those facts which are important in nursing medical cases.

The function of the nurse in medical diseases is to observe symptoms accurately, to recognize early signs of complications and to carry out the physician's orders intelligently. The intelligent observation of symptoms requires an understanding of the underlying physiological disturbances. Consequently the discussion of the important groups of diseases is preceded by a brief discussion of the physiology of the organs affected and the symptoms which result when this is disturbed. To recognize complications early it is essential to understand the underlying structural or other changes of disease. Consequently a brief discussion of pathology is included with the important diseases. The functional tests, preparation for X Ray, dietary treatment and nursing procedures are emphasized throughout the text because this constitutes the bulk of nursing practice in medical diseases. The method of treatment and nursing procedures are discussed in detail and thoroughly explained, to enable the nurse to carry out her orders and various therapeutic procedures intelligently.

The diseases are classified according to their clinical and nursing aspect. The uncommon and tropical diseases are grouped in special chapters which may be used for reference only. These chapters may be used as text in those regions of the world where these diseases are prevalent.

The contagious diseases are grouped together in order specially to emphasize their contagious nature, and the methods of preventing transmission, rather than their etiology.

I desire to express my thanks to my wife for valuable suggestions and assistance in reading the proof, to Miss Cecile Blumgarten for the preparation of many of the diets, to Miss Elizabeth Lindheimer for suggestions in nursing procedures, and to my secretary, Miss Alice H. Morrison, for assistance with the technical details and the preparation of the index.

A. S. Blumgarten.

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A TEXT BOOK OF MEDICINE

CHAPTER I

INTRODUCTION

Disease is any change in the normal function of the body. It may be accompanied by a change in structure of tissues or organs, or it may develop without any apparent structural change.

Classification

Diseases may be classified in several ways: (1) according to the cause, (2) according to the presence or absence of structural changes, (3) according to the organs principally affected, (4) according to the climate or country in which they are prevalent, (5) according to their duration; acute diseases are of short duration and chronic diseases run a prolonged course, (6) according to the usual method of treatment, medical or surgical.

We shall deal principally with the diseases commonly treated medically. They may be divided into three groups, as follows: (1) diseases due to specific causes, (2) diseases caused by a similar process, for example inflammatory diseases which are all caused by inflammation, (3) diseases of the various organs and systems of the body.

The diseases of organs or systems may be divided into organic and functional. Organic diseases are characterized by structural changes in organs or tissues. Functional diseases are those in which structural changes cannot be demonstrated. The functional diseases may be caused by chemical changes in the body, by mental conditions, by environment, or they may be the manifestation of an inherent constitutional makeup.

In order to treat or nurse any disease intelligently it is essential to understand its causes, the nature of the underlying structural changes, the symptoms produced, and the methods of treatment. We shall therefore consider some of the elementary facts of disease in general before discussing the various diseases in detail.

Etiology

Etiology deals with the causes of disease. Every disease has specific or predisposing causes or both.

Specific Causes: The specific cause may be a bacterial or

animal parasite, a chemical, vegetable or animal poison, a deficiency of necessary food elements, or deficient function of glands, etc. Sometimes the specific cause is general in nature, such as poor hygiene, insufficient or improper food, etc. The specific cause of many diseases is unknown. Typhoid fever is an example of a disease caused by a bacterial parasite, the typhoid bacillus. Malaria is a disease caused by an animal parasite, the plasmodium malariæ. Rickets is an example of a disease caused by deficient food principles. Diabetes is a disease caused by deficiency of insulin in the blood. Malnutrition is a disease caused by insufficient or improper food, etc.

Predisposing Causes: The predisposing causes are factors which produce a tendency for a disease to develop. They may be age, fatigue, climate, season, exposure to inclement weather, heredity and other factors. Pneumonia is an example of a disease which is caused by the pneumococcus, a germ, but exposure to wet and cold are important predisposing factors. It is more prevalent in winter than in summer. Arteriosclerosis and diabetes occur especially among persons who have an hereditary predisposition. Dysentery is more prevalent in the summer than in winter. Yellow fever occurs especially in the tropics.

Prevalence of Disease

The following terms are applied to diseases which occur among large groups of people at the same time or in certain localities:

1. Epidemic.
2. Endemic.
3. Pandemic.
4. Sporadic.

Epidemic Disease: An epidemic disease is a disease which affects a large number of people in a particular locality at the same time. For example, scarlet fever may occur as an epidemic when a large number of children in one locality are affected at the same time.

Pandemic Disease: A pandemic disease is a disease which spreads from one country to another, affecting large groups of people in each country. It usually spreads along the routes of travel and a pandemic may therefore extend around the entire world. For example, influenza is often a pandemic disease and one of the most extensive pandemics of influenza occurred in 1918. The disease started in Spain and spread to England and finally to the United States.

Endemic Disease: An endemic disease is a disease which is always prevalent in a particular locality. This is usually due to some characteristic of the locality, such as the climate, the nature of its water supply or the habits of the people living in that region. For example, goiter is an endemic disease in many regions of the world, such as the middle western part of the United States, Switzerland, etc. It is believed to be due to a deficiency of iodine in the water supply on account of the high altitude or inland position of these regions.

Sporadic Disease: A sporadic disease is a disease which occurs occasionally in regions where it is not usually prevalent. For example, sporadic goiter is an enlargement of the thyroid gland which occurs in regions where goiter is not prevalent and among people who have always lived there.

Transmission of Disease

Some diseases are transmitted from one person to another. They are called communicable diseases and may be divided into two groups: infectious and contagious diseases.

Infectious Disease: An infectious disease is caused by some specific germ, usually bacterial in nature. Most of the infectious diseases can only develop when a person comes in contact with the causative germ. This may result from handling the secretions, linens or utensils of a patient suffering with the disease. Some infectious diseases are transmitted by an intermediary such as an insect or animal.

Contagious Disease: A contagious disease is a communicable disease which may be contracted without coming directly in contact with the patient or any of the secretions or utensils. For example, measles and smallpox are contagious diseases, which may be contracted without direct contact with any of the secretions of the patient or with the patient himself. The nature of the causative organism of most of the contagious diseases is at present unknown. When the causative germ of a contagious disease is discovered it is usually demonstrated that the disease is transmitted by direct contact with the specific germ.

Pathology

Pathology is the study of the structural changes which occur in organs and tissues in disease. It is usually divided into gross and microscopic pathology.

Gross Pathology is the study of the structural changes which

can be seen with the naked eye. Pathologic histology or microscopic pathology is the study of those changes which can be seen only with the aid of the microscope.

Pathological Chemistry is the study of the chemical changes underlying various disease processes.

Many diseases are characterized by similar structural changes. The detailed study of these changes belongs to the domain of pathology. We shall, however, briefly discuss some of the fundamental pathological processes, because it is essential to understand the underlying processes in order to appreciate the manifestations of various diseases.

The most common fundamental processes of disease are the following:

1. Irritation.
2. Inflammation.
3. Ulceration.
4. Neoplasms or Tumors.

Irritation: Irritation is a state of mild injury of the cells or tissues or organs and the reaction which such injury produces. When the irritation is extensive many of the cells of the tissues are destroyed. This is sometimes called corrosion. For example, various poisons such as bichloride of mercury may cause severe irritation of the tissues with which they come in contact. As a result, many of the cells constituting the tissues are destroyed. Irritation is caused by chemical substances, physical changes such as heat and cold, and by bacteria or other parasites.

Inflammation: Inflammation is a process of reaction to irritation. The irritant may be chemical, bacterial, physical, etc. The object of the inflammatory process is to remove the irritant and to institute repair in the injured tissues. A thorough understanding of the mechanism of inflammation is essential in the study of infectious diseases, the diseases caused by bacteria. The process will therefore be described more in detail under the chapter on infection diseases; see page 17.

Ulceration: Ulceration is a process characterized by a loss of tissue on the surface of the skin or mucous membranes. This leaves a raw or exposed area which is called an ulcer. The process of ulceration may result from a simple inflammation, or from specific forms of inflammation such as tuberculous or syphilitic disease. Around the borders of the ulcer there is usually a healing process. Ulcers may occur on the surface of the skin, on the leg for instance. They occur in various organs, causing a

specific disease, such as an ulcer of the stomach. Ulceration in the intestines occurs in various infections such as typhoid fever, colitis, etc.

Tumors: Tumors, neoplasms or new growths are masses of tissue consisting of a group of cells arranged in such a manner that they form a mass or lump. A tumor usually originates from the tissue in which it develops. When it occurs in an organ it may originate from the functioning tissue of the organ, the epithelial tissue, or from the non-functioning or connective tissue.

Tumors may be classified in two groups: benign and malignant. Benign tumors form well-defined small or large masses which grow very slowly. The symptoms of benign tumors are merely due to pressure on neighboring structures. Thus a fibroma will produce pain along the course of a nerve if it happens to press upon an adjacent nerve.

Benign tumors derive their names from the tissues from which they originate. For example, a fibroma is a tumor originating from fibrous tissue, a lipoma is a tumor which forms from fat, a myoma is a tumor which develops from muscle tissue, a fibromyoma is a tumor made up of both fibrous and muscle tissue. An adenoma is a benign tumor which develops from glandular tissue. An adenoma of the breast is a common form of such a tumor.

Malignant tumor or cancer is a form of tumor which develops from the tissues of the organs in which it occurs, and grows very rapidly and lawlessly, forming a large mass which invades and grows into surrounding tissues. Many of the cells separate from the original tumor and enter the blood or lymph stream. These cells are carried by the circulation to other organs and tissues where they form similar tumors which are called metastases.

Malignant tumors occur in two forms: sarcoma and carcinoma. A sarcoma is a malignant tumor which originates from tissues such as muscle, bone, or connective tissue. It usually occurs in young persons and occurs in several forms according to the types of cells from which they develop: small round cell sarcoma, spindle cell sarcoma, giant cell sarcoma, etc.

A carcinoma is a form of malignant tumor which originates from glandular structures or from the epithelial tissues or functioning tissues of organs. The structure of carcinoma is similar to the tissue or organ from which it originates, but the tumor invades neighboring structures and forms metastases.

The symptoms of carcinoma and sarcoma, or cancer, are local and general. The local symptoms are due to pressure on neigh-

boring structures, or to interference with the function of the organ from which the cancer originates. The general symptoms consist of a progressive loss in weight and strength, severe anemia, and a characteristic pallor of the skin. This condition is called cachexia.

Carcinoma and sarcoma are usually fatal. They cause death by their rapid growth, which may destroy important structures or interfere with their function. They sometimes grow into a blood vessel and cause severe fatal hemorrhage. In most instances, however, the rapid growth of a cancer forms metastases and causes progressive cachexia, from which the patient dies.

Symptoms

Symptoms are the abnormal manifestations of the function of the body or of various organs, produced by disease. Each disease often produces characteristic symptoms by which it may be recognized. Symptoms may be divided into two groups: subjective and objective.

Subjective symptoms are those of which the patient complains; such as pain, loss of weight, headache, nausea, sleeplessness, etc.

Objective symptoms are those which may be observed or which may be determined by various methods of examination. They may be divided into three groups: (1) physical signs, (2) symptoms determined by various instrumental methods of examination, (3) symptoms determined by laboratory methods of examination.

Physical signs are those abnormal changes produced by disease that may be recognized by our senses; by the sense of sight, often spoken of as inspection, by the sense of touch, called palpation, and by the sense of hearing called auscultation.

We may note by inspection, changes in color of the skin, changes in the size of extremities, the type of breathing, etc. We may determine by palpation, the consistency of tissues, whether they are soft or hard, the shape of organs, the rate and character of the pulse, etc.

Percussion is a method of determining disease in organs by means of the sound which is produced when they are tapped. For example, a hard substance gives a characteristic sound when it is tapped and a spongy substance a different sound. Consequently this method is used by the physician to determine changes in the consistency of an organ. For example, when pneumonia develops the lungs are changed from a spongy to a

solid consistency. This changes the sound obtained when the chest is tapped.

Auscultation is a method of examination for determining various disease processes or structural changes by means of sounds produced in hollow organs. When a physician listens to the chest with a stethoscope while the patient is breathing, he hears certain sounds produced by the passage of air through the trachea and bronchi. When mucous accumulates in the bronchi certain characteristic fine bubbling sounds are heard as the column of air passes over the mucous. These sounds are known as râles. In some diseases of the lungs the character of the sound may become changed because of the change in the consistency of the lungs.

The physician usually recognizes heart disease by means of auscultation. The contraction of the heart produces certain characteristic sounds. When mechanical difficulties occur in the valves as a result of disease, certain abnormal and unusual sounds are produced known as murmurs. The physician is able to determine the type of heart disease by the character of the murmur.

Observation of Symptoms in Nursing: The function of the nurse is to observe the patient's symptoms, to record them accurately and to carry out the doctor's orders intelligently. She should record all the subjective symptoms and those objective symptoms which can be determined by observation, such as the color of the face, the rate of breathing, the change of contour of a structure, etc. The nurse counts the pulse rate and notes its character, she records the patient's temperature and observes and measures various excretions, the urine, the sputum, the stool, etc.

Objective Signs Determined by Instruments

There are many signs of disease which can only be determined by the use of various instruments. The most common signs obtained in this manner are the temperature and the blood pressure. X-ray examination of various organs, determination of the basal metabolic rate and examination with the electrocardiagraph are elaborate methods used in special cases.

Temperature: The body temperature is obtained by a specially constructed thermometer which records the temperature in degrees and fifths of degrees. It is determined by inserting a thermometer into the mouth or rectum or by placing it under

the axilla. The most accurate temperature is obtained in the rectum. The thermometer is inserted into the rectum, where it is allowed to remain for about a minute and the temperature registered is recorded. Rectal thermometers usually have a thicker mercury bulb than those used for the mouth. When the temperature is taken by mouth, the thermometer is placed under the tongue, the mouth is closed and the thermometer is allowed to remain in the mouth for a minute or two. The maximum temperature registered is then recorded. Mouth thermometers usually have a thin mercury bulb. The temperature is sometimes taken by placing the thermometer under the axilla for several minutes. This is an old-fashioned method which is now seldom used, and only in cases where it is impossible to insert a rectal or mouth thermometer. There is a slight difference in the temperature obtained by the various methods. The rectal temperature is usually about one-half to one degree higher than that obtained by mouth.

Blood Pressure: The blood pressure is determined by a special instrument devised for this purpose. It measures the force with which the blood flows through the arteries. The technique of determining the blood pressure will be described under the diseases of the circulatory system.

X-ray Examination: The X-ray or Roentgen ray is a special ray produced by an elaborate electrical apparatus which photographs certain structures such as the bones or various organs. The study of the X-ray photographs enables the physician to recognize disease processes in the bones and other organs. The stomach and intestines may be examined by the X-ray when these organs are filled with a bismuth paste. The pictures show these structures as definitely outlined shadows which may indicate various disease processes.

Basal Metabolism: This is a special method of examination to determine the basal metabolism or the rate at which oxidation takes place in the body. It is determined by special types of apparatus, in which the expired air is collected or in which the oxygen absorbed is measured. These are elaborate methods which will be discussed under the diseases in which such examinations are made.

Instruments for Examining the Heart: The heart is sometimes examined by special instruments. The electrocardiograph is an apparatus for studying the contractions of the heart. The polygraph is another type of apparatus for studying the character of the pulse.

Laboratory Examinations

There are many objective symptoms of disease which can only be determined by examination of various secretions or excretions of the body. The most common fluids examined are the urine, the blood and stomach contents.

Examination of the urine may give evidence of diseases of the kidneys or diseases of metabolism, by the presence of abnormal constituents in the urine, or by an increase or diminution of the normal constituents.

The examination of the blood frequently gives striking objective evidence of disease. Diseases of the blood are often characterized by a diminution or increase in the number of red blood cells, a reduction of the percentage of hemoglobin, or a diminution or increase in the number of white blood cells. The presence of abnormal substances or a change in normal constituents of the blood may be determined by a chemical examination of the blood. We sometimes get indirect evidence of the presence of an infection by a change in the number and character of the blood cells or by the presence of abnormal constituents in the blood.

The examination of the gastric juice will frequently give evidence of disease of the stomach. The normal constituents may be increased or diminished or abnormal substances may be present. A specimen of gastric juice is usually obtained by passing a rubber tube into the stomach and withdrawing the contents. The method will be described with the diseases in which it is used.

Bacteriological Examination: The specific germs which cause certain diseases may be found in the secretions, or excretions of the diseased organ or in the blood. Thus, in pulmonary tuberculosis the tubercle bacilli may be found in the sputum. Diphtheria is recognized by bacteriological examination of the membrane on the tonsils. The nature of some diseases is recognized by bacteriological examination of the blood. A small quantity of blood is obtained from a vein and placed in tubes containing special liquids, in which the germs grow readily. This method of examination is called taking a blood culture.

Onset, Course and Prodromal Symptoms

There are certain terms commonly used to indicate the time when a disease begins, and its duration.

Onset: The onset of a disease is usually the time when the first symptoms appear. It is sometimes difficult, however, to determine this definitely. Consequently in fevers the onset is

usually considered to be the time when the patient is sick enough to go to bed.

Course: The course of a disease is the duration of symptoms before convalescence is established. In most diseases the course is variable because it often depends on the vitality of the patient, the age and the nature of the disease itself. Some diseases, however, run a definite course.

Prodromal Symptoms: Prodromal symptoms are a group of symptoms which occur in many diseases before the onset. In measles, for example, nasal discharge and cough are the prodromal symptoms which occur before the onset of the disease.

Complications and Sequelæ

Complications: A complication is a group of unusual symptoms which occur in the course of a disease or after the patient has recovered. They usually result from extension of the disease process to other organs than those originally involved. For example, typhoid fever is often complicated by cholecystitis, an inflammation of the gall bladder.

Sequelæ: Sequelæ are conditions which develop after the patient has recovered from a disease. For example, valvular heart disease often follows an attack of acute rheumatic fever.

Relapse and Recrudescence

Relapse: A relapse is the recurrence of a disease. It usually occurs in its original form after the patient has apparently recovered.

Recrudescence: Recrudescence is a reappearance of some of the original symptoms of a disease in a mild form after the patient has recovered. Recrudescence is really a mild relapse. In typhoid fever and in malaria, as well as in other diseases, recrudescences are common.

Treatment of Disease

Therapeutics is that branch of medical science which deals with the treatment of disease. A disease is usually treated by one or several of the following methods:

1. Prophylactic treatment.
2. Specific treatment.
3. Symptomatic treatment.
4. Climatic treatment.
5. Drug treatment.

6. Physical treatment.
7. Dietary treatment.
8. Nursing care.

Prophylactic Treatment: Prophylactic or preventive treatment consists of eliminating the cause of disease, or modifying the causative factors, such as the diet, the manner of living, etc., in such a way that the disease will not develop. In diseases where the specific cause is known, certain remedies may be administered or certain methods of treatment may be used, which will prevent the disease by making the individual immune. For example, diphtheria is a disease known to be caused by a specific germ, the diphtheria bacillus. Children are now injected with small doses of a mixture of the toxin and the antitoxin of this germ to prevent them from contracting the disease. The injection of vaccines consisting of dead typhoid bacilli will prevent the occurrence of typhoid fever.

Specific Treatment: Specific treatment is a method of treatment which consists of using a specific remedy to cure the disease. The remedy may be an antidote prepared from the specific causative bacteria as in diphtheria. It may be a chemical substance, such as arsphenamine or salvarsan, which destroys the causative agent in syphilis. It may be a substance which supplies a deficiency in the body. For example, the treatment of diabetes by insulin consists of providing the deficient insulin by hypodermic injections. The treatment of myxœdema by thyroid extract consists of supplying the deficient thyroid secretion.

Symptomatic Treatment: Symptomatic treatment is a method of treatment which consists of avoiding strain on the organ affected or administering various remedies to modify or check the symptoms of the disease. This method is used when the specific cause is unknown or when specific treatment is not possible. It is occasionally used together with specific treatment.

The first principle of symptomatic treatment is rest. An organ is usually more able to overcome a disease process when its function is conserved by rest. For example, in acute nephritis the kidneys are acutely inflamed and unable to excrete waste products properly. The elimination of protein foods from the diet in this disease lessens the formation of waste products which are usually eliminated by the kidneys. Thus the function of the kidney is conserved and the inflammation subsides.

The symptomatic treatment of disease by drugs consists of administering drugs to produce effects opposite to those caused

by the disease, or giving such substances which modify the disturbed function of the organ. For example, in an infectious disease a rise in temperature is often a distressing symptom. It is sometimes desirable to reduce the temperature and various drugs are given for this purpose. The effects of toxins or poisons on the heart may be overcome by such remedies as caffein and digitalis, which strengthen the heart action. Pain may be relieved by such drugs as phenacetin, pyramidon, aspirin, morphine, etc.

It should be remembered, however, that when there is no specific remedy for a disease the disease is overcome by the inherent power of the body and the cure is dependent on two factors, a good resistance, a mild poison or infectious agent, or both. The best symptomatic treatment aims to aid the recuperative powers of the patient. Symptomatic treatment is only a makeshift, and is only useful to modify undesirable symptoms, to make the patient comfortable, and sometimes to relieve distressing symptoms.

Climatic Treatment: There are some diseases which are prevalent in certain climates. A change of climate may therefore cure or relieve these diseases. For example, hay fever is a disease which is prevalent in certain seasons and climates. Some patients are benefited by moving to a higher altitude and a dry climate.

Dietary Treatment: Many diseases are sometimes treated by modifying the patient's diet, that is, by eliminating certain kinds of foods, adding others, rearranging the diet, increasing or diminishing the frequency of feeding, etc. This method of treatment is used especially in diseases of the gastrointestinal tract and in diseases of metabolism. In some diseases of the gastrointestinal tract the digestion in the stomach may be disturbed. Consequently only such foods should be administered which are easily digested. In fevers, the secretion of gastric juice is diminished and the diet must be regulated accordingly. In diabetes, a disease in which the patient cannot utilize carbohydrate food, the diet usually ordered contains small quantities of carbohydrate or starchy food.

Physical Therapy: Many diseases are treated by various physical means. It is beyond the scope of this book to discuss the details of the various methods used. The most common forms are hydrotherapy, massage, electrotherapy, heliotherapy, X-ray therapy and radium therapy.

Hydrotherapy is a method of treatment by various baths. It is used to reduce temperature and to produce stimulating or

sedative effects. Massage is a method which improves the tone and circulation of weak or paralyzed muscles. Electrotherapy is a method of treatment with various forms of electricity. Heliotherapy is a method of treatment by natural or artificial sunlight or other forms of light. Artificial sunlight is applied by means of special lamps known as Alpine or Quartz lamps. X-ray therapy is treatment with X-ray. Radium therapy is treatment with radium. Cancer and some diseases of the thyroid gland are sometimes treated by X-ray and radium.

Nursing Care: Modern nursing has now been developed to such a state of efficiency that good nursing is an essential part of treatment, especially in the acute infectious diseases. The function of the nurse in the treatment of disease is to observe symptoms, to record any changes in the patient's condition, to watch for complications, to carry out the doctor's orders intelligently, to administer medicines accurately and above all to make the patient comfortable. The details of nursing care are described in books on practical nursing. It is beyond the scope of this book to discuss them at length, but they will be described in those diseases where special methods are used.

PART I: **INFECTIOUS AND ALLERGIC DISEASES**

CHAPTER II

INFECTION AND IMMUNITY

Infectious diseases are diseases caused by the presence of small micro-organisms in tissues or organs or in the circulating blood. The organisms may be vegetable in nature, such as the bacteria, or of an animal character such as the protozoa.

Methods of Transmission

The infectious diseases are communicable diseases which may be transmitted from one person to another in the following ways: (1) by direct contact, (2) by food, (3) by air, (4) by carriers, (5) by an intermediate host.

Direct Contact: An infectious disease is usually transmitted by direct contact by means of various secretions, excretions, or discharges from a patient suffering with a similar illness. Thus typhoid fever may be transmitted by handling the stools or urine of a patient suffering with typhoid fever because these excretions contain typhoid bacilli.

Food: Bacteria may occur in certain foods. When such contaminated food are eaten by susceptible persons, specific diseases may result. Typhoid fever, for example, often results from eating oysters or from drinking milk contaminated with typhoid bacilli.

Air: Some infectious diseases are transmitted by breathing contaminated air. When the sputum of a tuberculous patient dries the tubercle bacilli are scattered in the air. Consequently pulmonary tuberculosis may develop when a susceptible person breathes air containing tubercle bacilli.

Carriers: Carriers are individuals in whose secretions or excretions specific germs are constantly present. They have recovered from the infectious disease caused by these germs and are therefore immune; but they can transmit the disease to others. The most common diseases transmitted by carriers are typhoid and diphtheria. After recovery from typhoid fever the gall bladder may contain living typhoid bacilli for months or years, which

are constantly excreted into the intestine. The stools of such patients contain typhoid bacilli and the individual becomes a typhoid carrier and a menace to public health.

After recovery from diphtheria the throat of some patients contains living diphtheria bacilli for months. Carriers are especially dangerous to public health if their occupation requires handling food, since the food may become contaminated with the bacteria and transmit disease.

Intermediate Host: Many infectious diseases are transmitted by an intermediate host. This may be an insect or an animal who harbors the specific infectious agent, either in its natural form or in some other form. The insect usually transmits the disease by contact or by biting. Malaria, for example, is a disease which is transmitted to humans by the bite of a species of mosquito, the anopheles, when this mosquito harbors the infectious agent. When such a mosquito bites a patient suffering with malaria, or a malaria carrier, it absorbs some of the causative organisms. A normal person will develop malaria when subsequently bitten by such infected mosquitoes.

Susceptibility: When some individuals are exposed to infections they develop them readily, while others apparently do not develop them at all. Susceptibility is the increased tendency of an individual to develop an infection. It may be specific for some diseases or general in character. It may depend on age or on the patient's occupation, on the nature of the diet, on the climate in which he lives, or on his particular anatomical makeup. Fatigue, exhaustion and undernourishment also increase susceptibility.

Infection and Contagion

Infectious diseases are all communicable diseases, but they may be divided into two groups: those of known origin and those of unknown origin. The infectious diseases caused by specific germs usually derive their name from the organism which causes them. **Contagious diseases** are infectious diseases of unknown origin which are readily transmitted. Most of the contagious diseases are characterized by the occurrence of a rash in the course of the illness and they are therefore also called **exanthemata.**

The infectious diseases of known origin are usually transmitted by direct contact while the contagious diseases or exanthemata may be contracted without coming directly in contact with a patient suffering from the disease. It is believed that the infectious agent of most contagious diseases is transmitted by the air. Typhoid fever is an example of a specific infectious

disease which is transmitted by direct contact, by the excretions of the patient suffering from this disease and by contaminated food. Smallpox or measles, on the other hand, may be transmitted without direct contact.

We do not know the cause of most of the contagious diseases, nor do we know definitely that they are caused by germs. They are grouped with infectious diseases because they show all the manifestations of fever and the same symptoms that occur in infectious diseases caused by specific germs. When the specific cause of a contagious disease is discovered it usually proves to be a germ. For example, scarlet fever was always considered a contagious disease of unknown origin, but it has recently been proven that it is a disease caused by toxins of certain forms of streptococci.

Inflammation

In order to understand the symptoms and treatment of the infectious diseases it is essential to understand the mechanism of the fundamental process of these diseases. This process consists of two factors: (1) an irritation or injury produced by the causative bacteria, and (2) a reaction on the part of the body to this injury.

Inflammation is the reaction of the body to an irritant. In practical medicine, however, this reaction commonly results from bacteria. When bacteria lodge in a tissue or organ, they find the necessary elements for growth, such as moisture, protein food, suitable temperature, etc. They grow rapidly and develop in the tissues, producing poisons or toxins. The presence of the bacteria and their poisons causes a characteristic reaction in order to destroy the bacteria or neutralize their poisons.

The mechanism of the reaction is as follows: The blood capillaries in the affected area become dilated and the blood which they contain flows slowly. The white blood corpuscles then migrate to the region of the infection and many of them pass through the capillaries into the infected area. Other cells, especially small round cells known as fibroblasts, also migrate to this area. At the same time the serum of the blood, which contains antidotes for the poisons and the bacteria also oozes into the infected area. During this process many of the bacteria are destroyed by the leucocytes and some of their poisons are neutralized by the serum. The result of this combat between the bacteria and their poisons and the protective mechanism of the body, depends on the severity of the infection, the nature of the germ, and the resistance of the individual.

If the person is in good physical condition or if the bacteria are not very potent the process of inflammation may terminate and form an abscess which may rupture spontaneously or be opened by the surgeon's knife. In either case the pus is evacuated and healing takes place. The process of healing consists of the gradual formation of a scar by the fibroblasts, the small, round, connective tissue cells in the wall of the abscess. Granulation tissue or proud flesh is the soft red tissue seen in the wall of a healing wound which ultimately forms the scar.

When the bacteria are very poisonous or if the patient is in poor physical condition or suffers from some constitutional disease, such as diabetes, the protective barrier around the original site of the infection or abscess may be overcome. The poisons of the bacteria or the bacteria themselves will then spread into surrounding tissues or enter the blood stream and cause toxemia or bacteriemia.

We see numerous examples of various grades of infection and inflammation in practical medicine. An example of a mild infection is a small red pimple on the skin, caused by a simple infection by the bacteria which are constantly present on the skin. This pimple may remain for a few days and heal without any inconvenience. On the other hand, bacteria which are more poisonous may cause a small abscess, especially if the patient is in poor physical condition. The center of the abscess consists of serum, many bacteria, both living and dead, and destroyed and living white blood cells. This liquid, which is pus, is surrounded by a protecting wall consisting of leucocytes, small round cells or fibroblasts and dilated capillaries.

The cardinal symptoms of inflammation have been described for centuries as rubor, tumor, dolor and calor, or redness, swelling, pain and heat. In addition there is often loss in function of the affected organ.

Complications of Inflammation

When a severe inflammation spreads it may cause toxemia or bacteriemia.

Toxemia: Toxemia is a condition in which the bacteria are localized in some organ but their poisons are secreted into the blood. Diphtheria bacilli, for example, produce a characteristic local inflammation of the tonsils. The poisons of the bacilli, however, enter the blood stream and cause most of the symptoms by injuring various organs.

Bacteriemia: Bacteriemia is a condition in which bacteria are present in the blood stream. It is usually characterized by chills and fever. The bacteria often lodge in various organs, such as the spleen, the liver, the lungs or heart, causing inflammation or abscesses wherever they locate.

Immunity

Immunity is the ability to resist or overcome infections. It may be natural or acquired.

Natural Immunity: Natural immunity is an inherent tendency to resist disease. This may be racial or individual and may depend on climate, anatomical structure, mode of living, etc. Racial immunity is the resistance of certain races to specific infections. This may result from living in a climate in which these diseases are not prevalent, or from frequent attacks of a disease. On the other hand, some races are more susceptible to certain diseases. For example, the negro race is more susceptible to tuberculosis. The physical structure may be a factor in immunity. Thus, tuberculosis is more common in thin than in stout people.

Acquired Immunity: Acquired immunity is an immunity or resistance to disease which develops from having had an attack of the disease or from treatment. It may be naturally acquired or artificially acquired.

Naturally acquired immunity results from a previous attack of a disease. For example, a person who has had scarlet fever becomes immune to subsequent attacks.

Artificially acquired immunity is produced by the injection into the patient of some serum or antitoxin which has been artificially prepared. An example of artificially acquired immunity is the immunity to typhoid fever produced by the injection of typhoid vaccine, or the immunity to diphtheria produced by the injection of diphtheria antitoxin.

Mechanism of Immunity

The body overcomes infections by forming substances or developing processes antagonistic to the causative germs. The known substances or processes are the following:

1. Phagocytosis.
2. Bacteriolysis.
3. Antitoxins.
4. Opsonins.

5. Agglutinins.
6. Bacteriophage.
7. Nonspecific substances.

Phagocytosis: Phagocytosis is a property of the leucocytes whereby they destroy and absorb bacteria and other foreign substances in the blood and other parts of the body. This property was first described by Metchnikoff, a prominent French bacteriologist who therefore called the white blood corpuscles phagocytes or scavengers. In every local infection the white corpuscles accumulate at the site of the infection to destroy the bacteria. The normal number of leucocytes in the blood is about 10,000 to the cubic millimeter. When a local infection spreads or when an extensive infection is present in the body the white blood cells in the blood are increased in number. Some infectious diseases are characterized by an increase in the number of leucocytes in the blood while in others they are diminished. In pneumonia the leucocytes may be increased to 30,000 or 40,000 to the cubic millimeter. On the other hand, in typhoid fever the number of leucocytes is greatly diminished.

The resistance of a patient to infection is also indicated by the number of leucocytes. When a patient with good resistance has an infection the number of leucocytes in the blood are increased; but when the resistance is poor, the leucocytes are diminished.

The white corpuscles are of several kinds: the polynuclears which contain several nuclei, the lymphocytes, small cells containing one large nucleus, the mononuclears, large cells containing a single nucleus, and eosinophiles, corpuscles resembling the polynuclears, but which contain very large deeply staining granules.

The polynuclears constitute approximately 75 per cent of the leucocytes, the lymphocytes and mononuclears together constitute about 23 or 24 per cent and the eosinophiles one or two per cent.

These percentages are frequently changed by certain infectious diseases. An infection characterized by the formation of pus or an infectious disease like penumonia will increase not only the total number of leucocytes but the percentage of polynuclears as well. Tuberculosis will increase the number of lymphocytes. Intestinal worms increase the number of eosinophiles.

Bacteriolysis: Bacteriolysis is a property of the blood serum which enables the blood to destroy bacteria. The serum can be

made to develop this property by injecting an animal with repeated doses of bacteria and increasing the dose each time. The serum of the animal is then able to destroy the same kind of bacteria with which it was injected. Serums capable of destroying bacteria such as antistreptococcus serum, antipneumococcus serum, etc., are manufactured in this way. They are often used as specific remedies for streptococcus infections, pneumococcus infections, etc.

Antitoxins: In some infectious diseases the bacteria do not circulate in the blood stream but grow and propagate in some tissue or organ or in a wound. From this area the bacteria constantly secrete poisons or toxins into the blood stream. Diphtheria is a specific toxemia of this character. The disease is due to the formation of a membrane on the tonsils by the diphtheria bacilli. The poisons or toxins of the bacteria enter the blood stream and produce the symptoms of the disease.

Antitoxins or antidotes for bacterial toxins are made by repeatedly injecting an animal with the toxins of bacteria but increasing the dose of each injection. The serum of the injected animal is then used as a specific remedy. It is only effective for the disease caused by the same toxins as were used for making the serum. Diphtheria and tetanus are diseases which can be prevented and cured by their specific antitoxins.

Agglutinins: When bacteria circulate in the blood or when an infection is present in the body, the serum of the blood develops the property of gathering the bacteria into little groups or clumps and destroying them. This property is called agglutination. It is believed to be due to substances which form in the blood in the course of an infection, called agglutinins. They are specific for each kind of bacteria. If the patient is suffering from typhoid fever the serum will agglutinate only typhoid bacilli. In tuberculosis the serum of the patient will only agglutinate tubercle bacilli, etc.

The Widal test is a test for typhoid fever which consists of determining the ability of the patient's serum to agglutinate typhoid bacilli.

Opsonins: Opsonins are substances formed in the blood which accelerate the germ destroying property of the leucocytes.

Whenever an infection is present anywhere in the body or when bacteria are present in the blood stream many of the bacteria are destroyed. The dead bacteria cause the serum of the blood to form opsonins. They are specific substances; that is, they will destroy only the bacteria by which they are formed.

Bacterial vaccines are solutions of dead bacteria which are used in the treatment of many infections. They are given to form opsonins in the blood and thereby to help the leucocytes destroy bacteria. The vaccines used are of two kinds: autogenous vaccines and stock vaccines. Autogenous vaccines are made from bacteria obtained from the patient to be treated. Stock vaccines are made from the same kind of bacteria as those causing the infection, but the bacteria are obtained from other sources.

Bacteriophages: Bacteriophages are recently discovered specific substances which destroy bacteria. They are believed to be ultramicroscopic harmless bacteria which lodge in the body and destroy disease-producing bacteria.

Nonspecific Immune Reaction: A nonspecific immune reaction is a method of overcoming an infection by injecting the patient with any kind of dead bacteria. The beneficial effect on the infection is due to the severe chill and high fever which follows the injection. The bacteria commonly used to produce such an effect are dead typhoid and paratyphoid bacilli which are injected into a vein. The effect is not due to the bacteria but to the protein material which they contain. Consequently, sterilized milk, which contains protein, is sometimes injected into the muscles to produce a similar reaction.

Allergy and Anaphylaxis

Allergy and anaphylaxis are conditions of increased susceptibility to various vegetable and animal substances. There are some persons who are so susceptible to certain vegetable and animal proteins that a characteristic effect is produced whenever they come in contact with these substances. A number of diseases are caused in this manner. Hay fever is produced in susceptible individuals by the inhalation of pollens of ragweed, timothy, goldenrod, etc. Asthma is sometimes produced by the inhalation of emanations from various animal hairs such as horse hair, rabbit's hair, chicken feathers, goose feathers, etc. Urticaria or hives sometimes results when susceptible persons eat foods such as eggs, strawberries, certain vegetables, etc. The susceptibility to vegetable or animal substances or foods may be determined by applying them in powdered form on a scratch mark on the skin, or injecting a solution of it into the skin. If the patient is susceptible, a large white elevated area or wheal develops on the skin at the site of the injection. The attacks of hay fever or asthma may often be prevented or cured by eliminating the susceptible substance, by a change of climate, remov-

ing feather pillows, etc. Hay fever and asthma are often treated by repeated injections of minute doses of the causative proteins.

Classification of Infectious Diseases

The infectious diseases may be classified in many ways: according to the causative germ, the mode of transmission, the characteristic symptoms, the nature of the disease process, etc. It is impossible to classify all the diseases according to any of these characteristics because the essential facts of many of the infectious diseases are unknown.

A classification of infectious diseases for the nurse should emphasize the nature of the infection and the diseases process. This will enable her to nurse the disease intelligently, to appreciate the aim of treatment and the type of complication to watch for. It is important for her to know whether a disease is contagious, whether the disease process is in the intestines, the lungs, the brain, etc. According to such a plan the infectious diseases may be grouped as follows:

1. Bacteriemia.
2. Toxemia.
3. Specific Toxemias.
4. Contagious Diseases or Exanthemata.
5. Specific Infections of the Intestinal Tract.
6. Specific Local Infections.
7. Specific Infections of the Lungs.
8. Tuberculosis.
9. Specific Infections of the Nervous System.
10. Uncommon Infectious Diseases.
11. Protozoan Infections.
12. Intestinal Parasites.
13. Tropical Infectious Diseases.

Symptoms of Infectious Diseases

The symptoms of an infectious disease may be divided into the following groups:

1. Incubation Period.
2. Local Symptoms.
3. General Symptoms.

The incubation period is the time between the exposure to the infection and the development of the first symptoms. It varies with each infectious disease, and is usually a fairly definite time.

The local symptoms usually develop on the part of the body where the infection enters. In some diseases the local symptoms are characteristic. In diphtheria, for instance, there is a membrane on the tonsils. In typhoid fever there are ulcers in the intestines, which may cause diarrhea and blood in the stools. In tuberculosis there may be expectoration of pus or blood and the sputum may contain tubercle bacilli due to the local process in the lungs.

The general symptoms are due to the absorption of poisons from the site of the local infection or to the circulation of bacteria in the blood stream. They consist chiefly of fever and prostration.

Fever: Fever is a group of symptoms caused by the reaction of the body to infections. It may also result from sunstroke, the absorption of blood clots, etc. The most striking evidence of fever is the rise in body temperature. Consequently the terms fever and temperature are used interchangeably. However, the term fever means not only the temperature but all the symptoms generally associated with it. The onset of fever may be sudden or gradual. A sudden onset is usually initiated by a chill or chilly sensations, and in children often by a convulsion.

The symptoms of fever are objective and subjective. The essential objective symptom is a rise in body temperature which is usually in proportion to the severity of the infection. The pulse and respiration are rapid and in proportion to the temperature. For example, a temperature of 103 degrees Fahrenheit is accompanied by a pulse rate of about 120 and a respiration of about 30. A lower temperature is associated with a lower pulse rate and respiration. In some diseases, the relation between the temperature, pulse and respiration is unusual. Thus, in typhoid fever, the high temperature is associated with a normal or slow pulse. In diseases affecting the lungs, such as pneumonia, the temperature is accompanied by a more rapid respiration than usual. The other objective symptoms of fever are a warm dry skin, diminished output of urine, and an increase in the number of leucocytes in the blood. When the temperature is unusually high the patient is often delirious.

The subjective symptoms of fever are a feeling of illness, weakness, loss of appetite, thirst, headache and constipation.

The Temperature: The normal temperature of the body ranges about 98.6° F. It is usually somewhat less than a degree higher in the evening than in the morning.

At the onset of a fever the temperature may rise suddenly or gradually. When it rises gradually, the temperature becomes higher from day to day until it reaches a maximum. During its course the rise in temperature may be slight or very high; but it seldom reaches above 106° F. The variation of the morning and evening temperature may be similar to the normal or greater. The highest temperature reached in the course of a fever is called the **fastigium** or height. The temperature may persist for days or weeks and in some chronic illnesses even for months. In some diseases the temperature lasts for a definite time and then falls. It may drop suddenly or subside gradually. When the temperature falls suddenly the condition is called a **crisis.** When it subsides gradually the conditions is called **lysis.** The fever of pneumonia falls suddenly by crisis, while that of typhoid fever subsides gradually, by lysis. Remissions are recurrences of fever. The temperature begins to rise again, either suddenly or gradually, after it has already reached normal or nearly normal.

Classification of Fevers

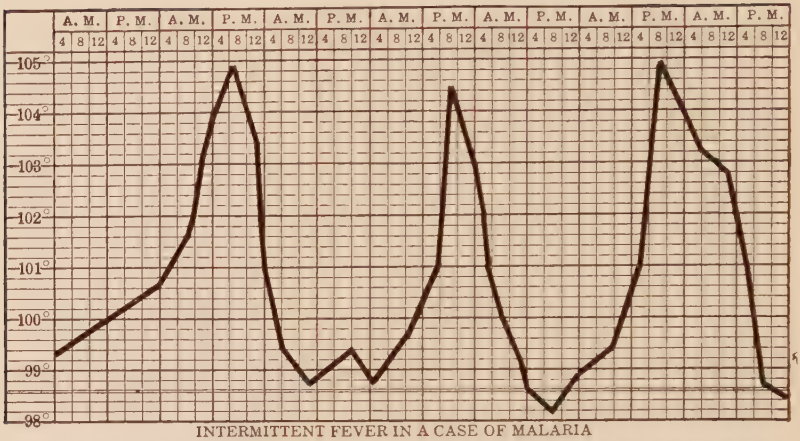
Fevers are usually classified according to the kind of temperature curve into three groups as follows:

1. Intermittent Fever.
2. Remittent Fever.
3. Continuous Fever.

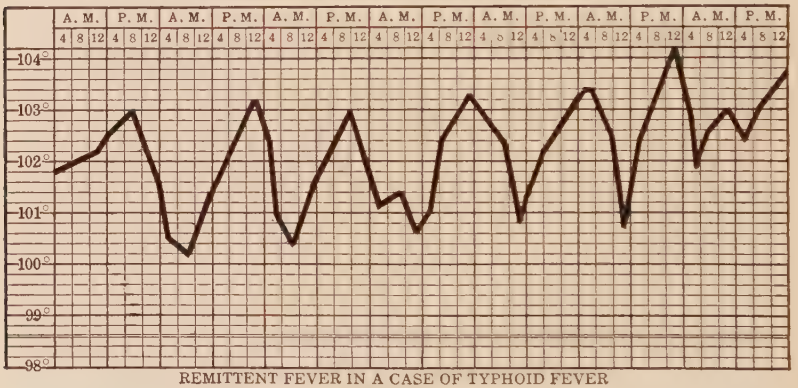
Intermittent Fever: An intermittent fever is a fever in which the maximum temperature is very high but the minimum temperature may reach normal or nearly normal. This type of fever occurs especially in malaria. The patient has chills and fever every day or every other day but the temperature is normal between the attacks.

Remittent Fever: A remittent fever is a fever characterized by a temperature curve in which the maximum and minimum temperates vary by several degrees, but the minimum temperature never reaches normal. This type of fever occurs in typhoid fever especially toward the end of the disease.

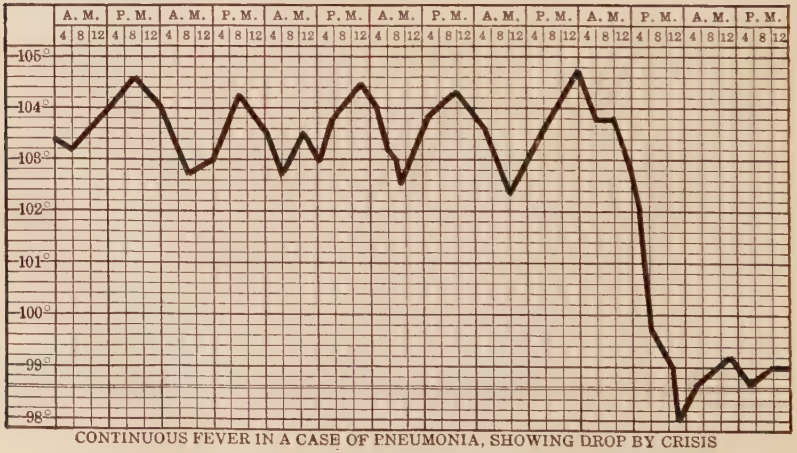
Continuous Fever: A continuous fever is a persistent fever in which the temperature curve shows only the slight daily variations of the normal temperature. The best example of a continuous fever occurs in typhoid fever.



INTERMITTENT FEVER IN A CASE OF MALARIA



REMITTENT FEVER IN A CASE OF TYPHOID FEVER



CONTINUOUS FEVER IN A CASE OF PNEUMONIA, SHOWING DROP BY CRISIS

Treatment of Infectious Diseases

The infectious diseases are treated by one or several of the following methods:

1. Preventive Treatment.
2. Isolation.
3. Specific Treatment.
4. Symptomatic Treatment.
5. Nursing Care.

Preventive Treatment: The preventive treatment consists of vaccinating or inoculating persons to make them immune to various infectious diseases. Vaccination will prevent smallpox, inoculation with typhoid vaccine prevents typhoid fever and the injection with diphtheria antitoxin prevents diphtheria. It is possible to recognize individuals who are susceptible to diphtheria by means of the Schick test, a test which will be described later. They may be made immune to the disease by injections of a mixture of diphtheria antitoxin and toxin.

Isolation: Quarantine or isolation is a method of preventing the spread of contagious and infectious diseases. The patient is kept in a separate room with separate dishes and linens. The dishes are sterilized after use. All the soiled linens are kept in antiseptic solutions before they are sent to the laundry. All the excreta are disinfected by antiseptic solutions. The windows should be screened to prevent the transmission of the disease by flies, mosquitoes or other insects. The nurse in charge should wear a gown and cap, and in some diseases she should wear rubber gloves whenever she handles the patient. She should scrub her hands thoroughly after handling the patient. When nursing a case of smallpox the nurse should be vaccinated, and when taking care of diphtheria she should be immunized by an injection of diphtheria antitoxin. The patient should have no visitors. Sometimes the immediate family are allowed short visits, but they should wear gowns and caps while in the room and should not touch the patient. They should be made immune by vaccination or by the injection of antitoxin, according to the disease.

Specific Treatment: The specific treatment of infectious diseases consists of administering specific curative serums. The diseases which are treated in this way are diphtheria, tetanus, and scarlet fever.

Symptomatic Treatment: The infectious diseases which can-

not be treated by a specific remedy are treated by alleviating the various symptoms of the disease as they arise. Rest is the most important part of all symptomatic treatment because it conserves the patient's strength and increases the resistance. The diet should consist of foods which are easily digeeted and when the fever is high only fluids are given. In prolonged fevers such as typhoid fever, the diet consists of large quantities of digestible food to maintain strength. The fever is usually not treated unless it is excessive. The most common methods used for reducing fever are various baths, such as cold sponges, cold packs, alcohol rubs, tub baths, etc., and coal-tar remedies, such as phenacetine, aspirin, pyramidon, acetanilid, etc. The elimination of waste products is usually stimulated by various cathartics, colon irrigations and enemas. The treatment of other symptoms will be described under the diseases in which they occur.

Nursing Care: Good nursing is the most important part of the treatment of infectious diseases, especially when there is no specific remedy for the disease. All the nursing procedures which tend to make the patient comfortable aid his recuperative powers. It is beyond the scope of this book to discuss the various nursing procedures in detail.

CHAPTER III

SEPTICEMIA

Septicemia is an infectious disease caused by the circulation of bacteria or their poisons in the blood stream. The disease occurs in two forms: bacteriemia and toxemia.

Bacteriemia is a disease in which bacteria circulate in the blood stream.

Toxemia is a condition in which the bacteria remain localized in some tissue or organ, but only their poisons or toxins circulate in the blood.

Other Forms of Septicemia

The following terms are commonly used to indicate special features of septicemia:

Pyemia, meaning pus in the blood, is a term sometimes used to indicate a form of septicemia or bacteriemia characterized by the formation of abscesses in various parts of the body.

Puerperal sepsis is a form of septicemia which follows childbirth.

Sapremia is a condition in which dead tissue which has not become infected is present in the body. The term is commonly applied to the fever which results when the placenta or afterbirth is retained in the uterus after childbirth.

Chronic sepsis or focal infection is a condition characterized by continued absorption of pus or toxins from a focus somewhere in the body such as the teeth, tonsils or other organs.

The symptoms of bacteriemia, toxemia and sapremia may be similar, but in bacteriemia the causative bacteria are found in the blood when a blood culture is taken.

BACTERIEMIA

Bacteriemia is an acute infectious disease characterized by bacteria circulating in the blood stream. The germs may be present in the blood throughout the course of the disease or only

at times. The disease is sometimes called by the name of the causative germ. For example, when it is caused by the streptococcus, the disease is called **streptococcemia.** If the staphylococcus is the cause, the disease is called **staphylococcemia,** etc. Some forms of bacteriemia are usually described as special diseases because the diseases were known before their nature and origin were recognized. Typhoid fever, for example, is a bacteriemia caused by the typhoid bacillus, but it is usually considered as a special disease.

Cryptogenic bacteriemia or sepsis is a form of bacteriemia in which a local infection cannot be discovered. Puerperal sepsis is a form of bacteriemia which follows childbirth. Bacterial endocarditis is a form of bacteriemia in which the valves of the heart are especially involved.

Cause: Bacteriemia usually results when a local infection extends into the blood stream. This may happen in infections of the uterus after childbirth, in mastoiditis, an infection of the temporal bone following ear infections; or in osteomyelitis, an acute infection of the bone marrow. It sometimes results from erysipelas, severe infections of the tonsils, infections of the kidneys, an infected finger or a local infection anywhere in the body.

The predisposing causes are old age, diabetes, alcoholism and poor physical condition.

Pathology: The disease process consists of a severe inflammation at the site of origin of the infection and the presence of bacteria in the blood stream. The original infection may be an abscess, an infected uterus, a severe infection of the tonsils, pus in the mastoid, etc. From the original local infection the bacteria enter the blood stream continually or periodically. Many of the bacteria are destroyed in the blood while others grow and develop. The circulating germs may lodge in some of the organs of the body forming abscesses or blocking blood vessels. When a blood vessel is blocked, an infarct or area of dead tissue develops in the affected organ. Abscesses and infarcts frequently develop in the course of the disease, in the spleen, the kidneys, the lungs, or the brain.

Symptoms

The symptoms are the presence of the original infection, fever, the symptoms caused by the development of abscesses or infarcts in various organs of the body, and blood changes.

Local Symptoms: The original infection is usually extensive

and shows only a slight tendency to heal. It is painful and spreads rapidly. For example, if a mastoiditis is followed by septicemia, the mastoid region becomes more painful and the skin around the mastoid becomes swollen. When erysipelas is followed by bacteriemia, the disease spreads rapidly and involves large areas of skin.

Fever: An important symptom of bacteriemia is fever, which is usually intermittent. The temperature may rise suddenly or gradually, often beginning with a chill. It persists throughout the course of the disease, ranging around 103° or 104° F. or higher, and is accompanied by a rapid pulse. Severe chills and profuse perspiration occur at frequent intervals. Sometimes the fever is remittent in character. The patient complains of headache, restlessness, weakness, feels ill and when the fever is very high he is delirious As the disease progresses the patient gets steadily weaker, he becomes anemic and emaciated.

Visceral Symptoms: The visceral symptoms are the symptoms produced when bacteria lodge in the spleen, the lungs, the heart, the brain or other organs, forming an abscess or infarct.

Whenever a new abscess or infarct develops or when another organ becomes involved, the patient gets another chill, sweats profusely and there is an increase in the temperature. This is accompanied by local symptoms indicating the location of the abscess or infarct. When the spleen is affected the patient complains of pain and tenderness in the left upper quadrant of the abdomen. If an infarct forms in the lung, the patient has severe pain in the chest, cough and expectoration of blood. Sometimes the infarct is so extensive that sudden death occurs. When an infarct or clot develops in the heart, the patient gets an attack of pain around the region of the heart and shortness of breath and may die suddenly. The formation of an abscess in the liver is characterized by a sudden sharp pain and tenderness in the region of the liver sometimes associated with jaundice. Frequently tiny clots form in the capillaries of the skin, which appear as tiny dark red spots called petechiæ.

Blood Changes: The diagnosis of bacteriemia is usually made by finding the specific causative germ in the blood. This is usually determined by means of a blood culture. A small quantity of blood is allowed to flow into a sterile bottle containing sterile broth or some other substance in which the bacteria grow readily. The kind of germ which the blood contains is then determined by bacteriological methods of examination. It is sometimes necessary to take several blood cultures before

the causative germ can be found, because the bacteria may circulate in the blood only at intervals. The white blood corpuscles of the blood and the polynuclear leucocytes are usually increased.

Course: Bacteriemia is usually a fatal disease. The fever lasts for weeks or months. One abscess or infarct after another develops in various organs. The patient finally dies of progressive wasting or from one of the abscesses or infarcts.

Complications: The complications of the disease are the abscesses or infarcts in various organs, but they constitute an essential part of the disease. Bed sores are the most common complications especially when the disease lasts a long time.

Treatment

The disease is treated by preventive, specific and symptomatic methods.

Prevention: Bacteriemia may be prevented by intensive surgical treatment of every focus of infection. Every abscess should be opened as soon as possible. Scrupulous care in maintaining asepsis during childbirth or during a surgical operation will prevent bacteriemia. Specific bacteriemias, such as typhoid fever, may be prevented by proper sanitation and prophylactic inoculation with vaccines.

Specific Treatment: The specific treatment consists in the use of serums, chemical antiseptics, and transfusion. When the causative germ of the bacteriemia is isolated from the blood, antibacterial serums, such as antistaphylococcus serum, antistreptococcus serum, etc., are given by injection. Vaccines are solutions of dead bacteria of the same kind as those causing the bacteriemia and are used in a similar manner. Chemical antiseptics such as mercurochrome, acriflavine, acriviolet, collargol, etc., are sometimes injected into the veins. Transfusions or the injection of blood from a normal individual is sometimes used because the normal blood contains substances which destroy bacteria. Sometimes a transfusion of blood is given after the donor has been immunized by repeated injections of the same kind of germs as those causing the bacteriemia.

Symptomatic Treatment: When specific treatment is not possible or when it is not effective, the various symptoms are treated as they arise. The resistance and strength of the patient is increased by rest, a suitable diet, overfeeding, fresh air and various tonics. The diet usually consists of plenty of nourishing food, given at frequent intervals. Whisky and other alcoholic

stimulants are frequently ordered. When the temperature is excessive, cold sponges, alcohol rubs or coal-tar remedies are used. Whenever a new abscess forms it is usually opened and drained.

Nursing Care: The nursing care consists of the usual procedures to make the patient comfortable. All discharges from wounds and all excretions should be disinfected. The nurse should wear a gown and rubber gloves to prevent contracting the infection. It is especially important to prevent bed sores by serupulous care of the skin and keeping the patient on a water bed as soon as the skin shows the slightest sign of irritation.

FOCAL INFECTIONS

Focal infections or chronic sepsis are chronic infections in different parts of the body. There is a continual absorption of toxins and bacteria from the infected area. This often causes chronic rheumatism, arthritis, infections of the joints, neuritis (infections of the nerves), nephritis (infections of the kidneys), heart disease and other diseases. The most common sites for focal infections are the tonsils, the teeth and sinuses of the bones of the skull.

Tonsils: When a patient has repeated attacks of tonsillitis, small abscesses frequently form in the tonsils. This forms a focus of infection from which there is often a continual absorption of pus or toxins.

Teeth: Chronic infections of the teeth are common and form small abscesses within the teeth or around the roots of the teeth. There is often a continual absorption of bacteria or toxins from these infected teeth.

Sinuses: The bones of the skull contain numerous cavities in which chronic infections frequently develop, and these cavities may contain pus. Various diseases in other organs often develop as the result of the absorption of bacteria or toxins from the infected sinuses.

Treatment

Whenever a focus of infection is discovered, it is usually treated surgically. Infected tonsils or teeth are removed. Infected sinuses are opened and the pus drained. These methods of treatment are frequently beneficial and sometimes cure the diseases caused by absorption of pus or toxins from these regions.

CHAPTER IV

SPECIFIC TOXEMIAS

Specific toxemias are toxemias caused by specific bacteria. The infection usually develops in some organ or part of the body, forming a characteristic type of inflammation. From this area there is a continual absorption of the poisons or toxins of the bacteria which produce the general symptoms. The most common specific toxemias are diphtheria, tetanus and scarlet fever.

DIPHTHERIA

Diphtheria is an acute infectious disease, a toxemia, caused by the Diphtheria bacillus or the Klebs-Loeffler bacillus.

Cause: The disease is especially common in young children, although adults not infrequently develop it. It occurs especially in susceptible persons whom we may now recognize by means of the Schick test. It is usually transmitted by the secretions of the throat of a diphtheria patient. The disease is also transmitted by carriers; persons who have recovered from diphtheria but whose throats and nasal secretions contain living diphtheria bacilli.

Pathology: The diphtheria bacilli form a peculiar grayish white membrane in the throat, on the tonsils, the pharynx, the larynx, or in the nose. The membrane usually starts in the tonsils and from there it spreads rapidly to other parts of the throat, to the pharynx, or to the nose. The bacteria in the membrane secrete toxins or poisons which are continually absorbed into the blood stream and affect various organs and tissues such as the heart muscle, certain nerve tissues, the kidneys, etc.

Symptoms

The incubation period is from one to five days and the disease usually begins suddenly. The symptoms may be divided into local and general symptoms.

Local Symptoms: The local symptoms are diagnostic and consist principally of a characteristic membrane in the throat, on

the tonsils and pharynx. In typical cases the membrane is grayish white in color, and when it is removed the area bleeds. The membrane may be confined only to the tonsils or spread to the pillars of the fauces or extend to the pharynx. In some cases it may consist originally of small white spots which stick in the follicles of the tonsils like an ordinary follicular tonsillitis, but they rapidly fuse and form a single membrane. The patient complains of a sore throat and pain in the neck. The lymph glands in the neck are usually swollen and tender.

Diphtheria in the nose is characterized by a purulent or membranous discharge from the nose which is frequently bloody.

The positive sign of diphtheria is the presence of diphtheria bacilli in the membrane or in the nasal or other discharges. This is determined by taking a culture of the membrane or the discharge. It is therefore the best practice to always take a culture of the secretions in any sore throat or whenever diphtheria may be suspected because of a purulent or bloody discharge from the nose.

General Symptoms: The general symptoms are the symptoms of fever and toxemia. The temperature is usually about 101° to 102° F. and sometimes higher. It is usually lower than in tonsillitis, a disease which frequently simulates diphtheria. The pulse is rapid and has a tendency to be irregular. The patient complains of headache, loss of appetite, a feeling of illness and is markedly prostrated.

Uncommon Forms of Diphtheria

Diphtheria may also affect the larynx or nose. Occasionally diphtheria of the conjunctiva or other mucous membranes occurs. Wherever it occurs the disease is characterized by the formation of a membrane which contains diphtheria bacilli.

Laryngeal Diphtheria: Diphtheria of the larynx is a form of diphtheria in which the membrane forms in the larynx. The disease is usually an extension of diphtheria from the throat or nose, although it sometimes begins in the larynx.

The symptoms are progressive shortness of breath and cyanosis caused by the obstruction of the larynx by the membrane, and fever. The child has to sit up and hold on to the bed in order to breathe and the chest moves with each respiration. The patient is blue and gets frequent attacks of coughing during which pieces of membrane are expectorated. When the membrane is extensive the child may choke to death.

Nasal Diphtheria: Nasal diphtheria is a form of diphtheria

which affects the nose. It may be an extension of diphtheria of the throat or it may begin in the nose.

The symptoms consist of a bloody membranous discharge from the nose, associated with fever. Nasal diphtheria is often so mild that it may be overlooked unless a culture of the discharge is taken. Diphtheria carriers may have diphtheria bacilli in their nasal discharges constantly and thereby transmit the disease.

Malignant Diphtheria: Malignant diphtheria is a severe fatal form of diphtheria characterized by an extensive membrane in the throat, high fever, severe toxic symptoms, and hemorrhages into the skin and throat.

Diphtheria of the Conjunctiva: This is a form of diphtheria characterized by the formation of a membrane on the conjunctiva of the eye. There is usually no fever or toxic symptoms.

Complications

The most common complications of diphtheria are affections of the heart, the nerves or the kidneys and result from the effect of the diphtheria poison on these organs.

Heart Complications: The effect of diphtheria poison on the heart may be mild or severe. In mild cases the pulse becomes irregular or rapid during the second week of the illness. This may persist for a long time or the irregularity of the pulse may become permanent. When the heart is severely affected the pulse becomes slow, sometimes about 30 or 40 to the minute, and irregular. The heart action becomes worse and the patient dies. This condition may develop in the second or third week of the disease, and occasionally later. Sometimes sudden death occurs when the patient attempts to sit up or walk about.

Nerve Complications: The diphtheria poison frequently affects the nerves of the muscles of the palate, the eye muscles, and the vagus nerves. When the motor nerves of the palate are affected, the palatal muscles become paralyzed. As a result food comes through the nose during the act of swallowing because the paralyzed muscles are unable to close the back of the nose, an act which is necessary in swallowing. When the nerves of the eye muscles are affected some of the muscles become paralyzed and the patient becomes cross-eyed. When the muscles on the outer side of the eye are paralyzed the eye turns in (internal strabismus). When the muscles on the inner side of the eye are paralyzed, the eye turns out (external strabismus). The paralysis of the palate or of the eye muscles is usually temporary and lasts

several weeks. When the vagus nerve is affected some of the heart complications already described develop.

Other Complications: Nephritis, an acute inflammation of the kidney, sometimes develops in severe cases. Bronchopneumonia, an acute inflammation of the lungs, often develops in laryngeal diphtheria from the extension of the diphtheritic membrane into the bronchi and lungs.

Treatment

Diphtheria is treated by preventive, specific, and local methods.

Preventive Treatment: Diphtheria may be prevented by the following methods:

1. Determining susceptible persons by means of the Schick test.
2. Immunizing susceptible persons.
3. When diphtheria is prevalent, by immunizing exposed persons without determining their susceptibility.
4. Quarantine of every diphtheria patient.
5. Isolation and treatment of carriers, to destroy the diphtheria bacilli in the throat or nose.

The Schick Test: The Schick test is a test which determines the individuals who are susceptible to diphtheria. It is performed by injecting one or two drops of a solution of the toxin or poison obtained from the diphtheria bacillus. If the person is susceptible, a small red, hard spot develops at the site of injection within twenty-four to forty-eight hours, otherwise no effect is produced.

Diphtheria Immunization: When a person has been found to be susceptible to diphtheria by means of the Schick test, he may be made immune by several injections of increasing doses of a mixture of diphtheria toxin and antitoxin. When a case of diphtheria develops in a family or household, all exposed persons, especially children, should be immunized by a suitable dose of diphtheria antitoxin. A nurse who is taking care of a diphtheria patient is usually also immunized by the injection of a suitable dose of antitoxin.

Specific Treatment: Diphtheria is treated by injections of diphtheria antitoxin, the specific remedy which cures the disease. The serum is obtained from horses who have been immunized against diphtheria toxin. The remedy is given as soon as the physician has determined by means of a throat culture that the patient has diphtheria. When it is impossible to obtain the

report of a culture soon enough, in country practice for instance, or when delay would be dangerous, antitoxin is given whenever there is a reasonable suspicion of diphtheria. The specific treatment of diphtheria is one of the greatest accomplishments of modern medicine. No case is considered hopeless and antitoxin is often curative even in the severest cases. Antitoxin is injected intramuscularly or intravenously, depending upon the severity of the case. It is given repeatedly until the membrane in the throat disappears and the symptoms of the disease subside. The dosage depends upon the extent of the membrane, the severity of the toxemia and the duration of the disease. The average case requires anywhere from five to fifteen thousand units or more. If there is no evidence of improvement in six or twelve hours the original dose is repeated. In laryngeal cases larger doses are given and sometimes intravenously.

Effect of Antitoxin: The effect of diphtheria antitoxin is remarkable. Within twelve hours after the injection of antitoxin the membrane in the throat begins to loosen and becomes smaller. The temperature subsides, the pulse becomes slower, the prostration and feeling of illness rapidly disappear. In two or three days the membrane disintegrates and disappears entirely.

Serum Sickness: The injection of diphtheria antitoxin sometimes produces an unusual effect which is known as an anaphylactic reaction. It occurs in individuals who are susceptible to horse serum. The reaction develops about seven to ten days after antitoxin has been given. It consists of a rash and general symptoms. The rash is hives or urticaria, and consists of numerous characteristic large or small elevated white or red spots which itch intensely. The general symptoms are fever, intense weakness and pains in the joints. The symptoms disappear in three or four days. They may be relieved by the injection of adrenalin or epinephrin, or by atropine.

Local Treatment: It is sometimes necessary to relieve the inflammation in the throat by local remedies. This is accomplished by the use of gargles or sprays. The solutions commonly used are boric acid solutions, Dobell's solution, Liquor alkalinus, hydrogen peroxide, Loeffler's solution, which contains iron chloride, normal salt solution, etc. Some physicians order throat irrigations with warm normal salt solution. Ice bags or cold compresses are often applied to the neck. In nasal diphtheria the nose is often irrigated with normal salt solution, or sprayed with boric acid solutions or other substances. In nasal diph-

theria inhalations of steam with benzoin, phenol or other substances are given.

Diet: The diet usually consists principally of liquids because swallowing is painful. Milk, soups, gruels, fruit juices, and plenty of water are the foods usually given. Ice cream is commonly ordered because anything cold relieves the inflammation.

Nursing Care: The patient is usually isolated under strict quarantine. Separate dishes are used which should be sterilized after use. The secretions and the gauze and cotton used about the patient should be disinfected and burned. The urine and stools should be disinfected. The nurse and the members of the family who visit the patient should wear a gown and hood. When giving local treatments in the throat the nurse should wear a mask and rubber gloves.

Method of Taking Throat Cultures: The nurse frequently has to assist the physician in taking cultures of the throat secretions. During convalescence the subsequent cultures are often taken by the nurse. The cultures are taken with special sterile applicators and the secretions are placed in special culture tubes which are supplied by the Board of Health in large cities or by various laboratories. The patient should be in a sitting posture. A child should be wrapped around with a sheet or the arms should be held to prevent struggling. The mouth should be opened wide, and the tongue depressed with a tongue depressor or the handle of a spoon. The sterile cotton swab is removed from its container and gently applied on the tonsils or throat to remove some of the secretions. It is essential not to touch any other part of the mouth or throat. The secretions obtained are then smeared on the agar slant in the special culture tube, taking care not to touch the sides of the tube. The tube is then closed with its cotton plug and labeled with the name of the patient and date. The applicator is then replaced in its container. When a culture of the nasal secretions is taken, the sterile applicator is inserted into the nose and the secretions obtained are applied on the agar slant in the usual manner.

Intubation

Intubation is a method of relieving the obstruction of the larynx caused by the membrane, in diphtheria of the larynx. The operation consists of inserting a special gold or silver tube known as O'Dwyer's tube into the larynx, by means of a special instrument called an intubator. The patient is placed in a sitting

posture and wrapped around with a mummy sheet. The physician depresses the tongue and inserts the index finger in the throat until he feels the epiglottis. He then passes the tube along this finger and inserts it into the larynx. When the tube enters the larynx the shortness of breath and cyanosis are immediately relieved. The tube is usually left in the larynx for two or three days or longer until the disease is cured by the injections of antitoxin. It is then removed by an instrument known as an extubator.

Care of Tube Cases: The patient with a tube in the larynx should be kept absolutely quiet. Sometimes the tube gets clogged by membrane, and the patient gets an attack of shortness of breath, coughing and becomes blue. When this occurs the tube should be removed immediately by means of the string which is attached to it, and the physician should be notified at once.

Feeding Tube Cases: It is important to feed a tube case carefully. The act of swallowing may dislocate the tube or food may pass into the lungs through the tube. The diet ordered consists of small quantities of soft foods such as thick cereals, mashed potatoes, etc. If the child is too young to take soft food, fluids may be given. During feedings the child is wrapped in a mummy sheet and held in the lap flat on the back. The liquids are then slowly poured against the hard palate with a long-necked swan cup.

Complications of Intubation: When it is necessary to keep a tube in place for a long time, the patient may become so accustomed to the tube that he cannot get along without it. If it is removed, the patient gets a severe attack of shortness of breath. The attack is relieved by the insertion of a tube into the larynx. These patients have to be treated by special methods for a long time before they can get along without a tube.

Treatment of Complications: The cardiac complications are treated by prolonged rest. The patient is not allowed to be up and about until exertion causes no change in the character of the pulse. In severe cases the usual cardiac remedies are given. The paralysis of the palate is treated by diet to avoid regurgitation of food through the nose. The patient is fed carefully with small quantities of food. If this method is not effective the patient is fed by a duodenal tube or by rectum. The condition usually improves in several weeks.

Removal of Quarantine: The Department of Health in most cities requires diphtheria patients to remain isolated until three successive cultures of the throat are free from diphtheria bacilli. Each culture is to be taken at intervals of two days. When

diphtheria bacilli still persist in the throat, they may be made to disappear by local applications of various antiseptics or lactic acid forming bacteria.

TETANUS

Tetanus or lockjaw is an acute infectious disease, a toxemia, caused by the Tetanus bacillus. The disease is characterized by spasms of various muscles and is usually fatal.

Cause: The Tetanus bacillus is usually found in soil, garden earth and in the manure of herbiverous animals such as horses and cattle. It is a very resistant germ and may remain alive for years. The bacillus is anerobic, that is, it does not require oxygen for its growth. Tetanus may therefore develop when soil or dirt is forced into a deep wound. The most common wounds in which tetanus may develop are gunshot wounds or wounds caused by exploding firecrackers. Tetanus sometimes develops from vaccination when the vaccine has been obtained from unclean calves. It may also result from the use of improperly sterilized catgut because the intestines of sheep, from which catgut is made, may contain tetanus bacilli. In China, tetanus not infrequently develops in newly born children from infection of the navel in childbirth.

Pathology: The disease process consists of an infection by Tetanus bacilli in a closed wound. The toxins or poisons of the bacilli are absorbed from the local wound and ultimately affect the nerves or the spinal cord.

Symptoms

The incubation period may be from one to twenty days; it is usually from five to ten days.

The symptoms develop gradually, beginning with chilly feelings and slight rise in temperature. As a rule, the temperature is not very high, but it sometimes reaches 105° or 106° F. The patient complains of stiffness in the neck and jaw and gradually develops spasms or contractions of various muscles. The muscles of the face and those which open and close the jaw are first affected. The jaw becomes stiff, a condition known as lockjaw or trismus. The contraction of the facial muscles raises the eyebrows and elevates the angles of the mouth, producing a characteristic facial expression known as a sardonic grin. Gradually spasms of other muscles develop. The neck becomes rigid and the abdominal muscles become spastic. Opisthotonus is a condition of extreme rigidity of the entire trunk which usually results

from contractions of the muscles of the back. The patient lies rigid with the spine and head bent backward. Sometimes the body is bent to one side or forward.

The spasms increase in severity and finally general tetanic convulsions develop. They are usually reflex in character, that is, they are produced by any irritation, such as a loud voice, a flash of light, moving the patient or even by changing the bedclothes. The patient is very sensitive to light and sound and perspires profusely. The disease is usually fatal, the patient dies in a convulsion or from asphyxia produced by a spasm of the larynx.

Forms of Tetanus: There are three uncommon forms of tetanus: cephalic tetanus, post-operative tetanus, and tetanus of the new-born.

Cephalic tetanus is a form of tetanus which results from a wound in the head and the spasms are confined principally to the jaw and throat.

Post-operative tetanus is a form of tetanus which follows operations and results from infected catgut used in an operation.

Tetanus in the new-born is a form of tetanus which is prevalent in Oriental countries, especially in China, and is caused by infection of the navel by dirt or soil. The symptoms appear in a few days and are principally continual crying, followed by the characteristic general spasms.

Treatment

Tetanus is treated by preventive, specific and symptomatic methods.

Preventive Treatment: Tetanus may be prevented by the injection of tetanus antitoxin. It is given in doses of 1,000 units when a patient has a wound from which tetanus may develop, such as a gunshot wound, Fourth of July firecracker wound, or wounds on the battlefield, when a soldier has to lie on the ground. During the World War every soldier with a gunshot wound was given an injection of tetanus antitoxin as soon as he was seen.

At the same time the wound is usually kept wide open by a deep incision to allow air and oxygen to enter, because tetanus bacilli cannot grow in the presence of oxygen.

Specific Treatment: The specific remedy for tetanus is tetanus antitoxin. It is more effective, however, for prevention than for treatment, because the symptoms of the disease are caused by irreparable destruction of the nerves and spinal cord tissue. When the symptoms develop it is frequently too late for effective

treatment. The antitoxin is usually given by injection into the muscles, and in severe cases it is injected into the veins or even into the spinal canal. About 3,000 to 5,000 units are given as an initial dose, which is repeated every day or every other day. In severe cases 10,000 units are injected into the veins every three or four days and a usual dose is injected into the spine every day.

Symptomatic Treatment: The spasms and convulsions are usually treated by inhalations of chloroform or ether. Morphine, chloral hydrate, bromides, or injections of magnesium sulphate into the spine are the remedies used to prevent the convulsions. The patient should be kept in a quiet dark room to avoid the irritation of light and sound. When the stiffness of the jaw prevents feeding, the patient has to be fed by rectum or by a tube passed into the stomach through the nose.

SCARLET FEVER

Scarlet fever is an acute infectious disease, a toxemia, marked by the occurrence of a characteristic scarlet rash.

Cause: The specific cause of scarlet fever is a type of the Streptococcus hemolyticus.

Scarlet fever is especially prevalent in children up to the tenth year, although it may occur in older children and in adults as well. The disease develops in susceptible individuals when they are exposed to active or convalescing cases. It frequently occurs as an epidemic, but cases are always prevalent in large cities, especially during the winter. Scarlet fever is one of the most fatal illnesses of childhood and ranks fifth among the diseases that cause infant mortality.

Pathology: Scarlet fever is a toxemia caused by certain strains of Streptococcus hemolyticus. The germs are present in the throat, nose and pharynx in most of the cases during the first week of the illness and in many cases throughout the disease. They are also found in the tonsils and throat of convalescing cases. From the throat toxins are absorbed into the blood stream, which cause all the general symptoms and the rash. Many of the complications, however, are due not only to the toxemia but also to the presence of the bacteria themselves in various organs.

Symptoms

The incubation period may be from one to seven days; it is usually about four days. The disease begins suddenly, commonly

with vomiting, and a rise in temperature. In children it often begins with convulsions. The symptoms consist of the symptoms of fever, a sore throat and a characteristic eruption.

Fever: The temperature is usually quite high, about 103° or 104° F.; sometimes it reaches 105° or 106° F. It persists throughout the acute stage of the illness with slight morning remissions, gradually subsiding within a week. The pulse is rapid, about 120 to 140 and in proportion to the temperature. The patient has all the usual symptoms of fever: dryness of the skin, a flushed face, a coated tongue, headache, loss of appetite, and a feeling of illness. The urine is rather scanty and high colored. When the fever is unusually high delirium may be present. The fever usually subsides when the rash disappears.

Appearance of Throat: The appearance of the throat is very characteristic and is evident before the onset of the rash. The throat, tonsils and soft palate are inflamed and swollen and have an intense scarlet fiery red appearance. The tongue is at first red at the tips and furred in the center. The fur disappears and the swollen papillæ give the tongue a strawberry or raspberry appearance. This is called a strawberry tongue. The glands of the neck are usually swollen.

The Rash: The diagnostic feature of scarlet fever is the characteristic rash, which usually appears on the second day of the disease. It is an intense scarlet red eruption which may or may not itch and gets darker in color from day to day. It is made up of very small, minute, red points, not raised. It occurs first on the neck and chest and by the second day it has spread rapidly over the entire skin, except the face. The rash usually disappears in about four to seven days and is followed by the period of desquamation. This lasts about ten to fifteen days, during which the skin gradually peels in large flakes especially when the rash has been intense. The desquamation sometimes takes longer and occasionally the rash is so slight that desquamation is the most characteristic sign of the illness.

Unusual Forms of Scarlet Fever: Scarlet fever may occur in atypical forms: a mild form, a malignant form, an anginoid form and a septic form.

Mild Form: There are mild cases of scarlet fever with a very slight rash, but the throat symptoms are typical and the skin desquamates.

Malignant Scarlet Fever: This is a very severe form of scarlet fever which is characterized by very high temperature, extreme prostration, delirium, restlessness, convulsions and coma.

The rash is extensive and there are numerous small hemorrhages in the skin. This form of the disease occurs in feeble children and is usually fatal.

Anginoid Form: This is a form of scarlet fever in which the throat symptoms are severe and the rash is very slight. The tonsils and throat are severely inflamed and covered with a thick membrane which often resembles malignant diphtheria. Frequently part of the tonsils, or areas in the throat become gangrenous and there is a foul odor from the mouth. This form of the disease is often fatal.

Septic Form: This is a form of scarlet fever which is characterized by severe general symptoms of toxemia. The patient is quite prostrated and runs a very high temperature for a long time. The throat is severely inflamed and may ulcerate. The lymph glands in the neck become inflamed and enlarged.

Complications

The most common complications of scarlet fever are acute nephritis, arthritis, ear complications, adenitis and cardiac complications. The rare complications are bronchopneumonia and relapse.

Acute Nephritis: This is the most common complication of scarlet fever. It occurs in two forms: an acute hemorrhagic nephritis or a slowly developing acute nephritis.

The acute hemorrhagic nephritis appears suddenly, early in the disease. It is characterized by suppression of urine and the urine is sometimes bloody and contains albumin and casts. Acute uremia may develop, with vomiting and convulsions.

In some cases acute nephritis develops very gradually, in the third or fourth week of the illness. It is manifest by a gradual diminution in the daily quantity of urine, albumin in the urine, puffiness of the eyelids and edema or swelling of the extremities. This form of nephritis is apt to last longer and may develop into a chronic nephritis.

Arthritis: This complication usually occurs in the second or third week of the illness. Several of the joints, especially the small joints of the hands and feet, become painful and swollen Occasionally a severe infection of the joints may develop with the formation of pus.

Ear Complications: The severe inflammation of the throat may extend up to the ear, causing otitis media, an inflammation of the middle ear. The ear inflammation may extend into the mastoid process, producing mastoiditis.

Adenitis: In severe cases the lymph glands in the neck become inflamed and swollen and pus may form in some of the glands, which may require incisions.

Cardiac Complications: Scarlet fever may cause an inflammation of the heart. The symptoms may develop slowly, and are chiefly pain around the heart, a rapid, irregular pulse, or shortness of breath.

Bronchopneumonia occasionally develops as a complication of scarlet fever.

Relapse, in which the patient goes through the same course as the original illness, not infrequently develops during convalescence.

Diphtheria or measles may occur together with scarlet fever. The combination is usually a very serious condition.

Treatment

Scarlet fever is treated by preventive, specific, and symptomatic methods and by suitable isolation.

Preventive Treatment: Scarlet fever may be prevented by isolating every case under strict quarantine and by recognizing susceptible individuals by means of the Dick test and immunizing them.

The Dick Test: This is a test to determine the susceptibility to scarlet fever and is performed as follows: About 1/10 of a cubic centimeter of a 1 to 2000 solution of the filtered toxin of Streptococcus hemolyticus is injected into the skin of the forearm. A few inches away a similar dose of heated toxin is injected as a control. If the individual is susceptible to scarlet fever a small firm red area about the size of a five-cent piece or a quarter develops at the site of injection within twenty-four hours. This spot disappears in forty-eight hours, leaving a pigmented area which lasts for five or six days.

The Dick test is also used to differentiate a scarlet fever rash from other eruptions. The injection of 1/10 or 2/10 of a cubic centimeter of concentrated Streptococcus toxin will produce a white area with a red zone in the center if the rash is scarlet fever. If the rash is not scarlet fever no effect is produced.

Immunization: The susceptible individuals may be immunized by repeated injections of gradually increasing doses of a mixture of the toxin and antitoxin of the Streptococcus hemolyticus. The method has only been used for the last few years.

Specific Treatment: The specific remedy for scarlet fever is

Streptococcus antitoxin. It is given by injections deep into the gluteal muscles in doses of 5 to 10 c.c. The effect of the injections, especially when given early in this disease, that is, during the first three days, seems to be curative. The temperature drops suddenly, the pulse rate becomes normal, the rash fades rapidly, the toxemia subsides, the throat symptoms diminish and the glands in the neck become smaller. The proper use of scarlet fever antitoxin may prevent the occurrence of complications. If it is given late in the disease the effect is not so marked nor has it any effect on the complications.

The serum of patients convalescing from scarlet fever is sometimes used as a specific remedy. It is injected into patients suffering with scarlet fever.

Isolation: The patient should be isolated in a separate room away from other members of the family. Separate dishes and linens should be used. The dishes should be boiled before they are used again and the linens should be kept in antiseptic solutions before being sent to the laundry. The nurse or attendant should be immunized with scarlet fever antitoxin. She should wear a gown and carry out the usual measures to prevent transmission of the infection. Visitors are usually strictly limited and those who come in contact with the child should gargle the throat frequently with an antiseptic gargle. Quarantine is usually maintained for five or six weeks, until desquamation is complete. When the child recovers it should be kept away from other children for a week or two, or longer if there is a discharge from a wound or ear.

Symptomatic Treatment: The symptomatic treatment consists of measures to relieve the symptoms and prevent complications. The patient should be kept in bed until about two weeks after the fever has subsided. When the fever is excessive the patient usually receives cold sponges or an alcohol rub or cold packs. Some physicians order a warm bath with a temperature of about 80° F. to bring out the rash.

The care of the mouth and throat is especially important in scarlet fever, since ear complications are frequent. The nose should be kept clean, preferably by dropping normal salt solution or albolene into the nose. The throat is irrigated or gargled with an alkaline douche. When the throat symptoms are severe or when the lymph glands in the neck are swollen, an ice bag or other cold application to the neck is frequently applied. The ears are usually examined daily by the physician, and the nurse should

have various cleansing substances, cotton, gauze, etc., ready for his visits. The daily output of urine should be measured and the urine should be examined every day.

The Diet: The diet is the usual diet of fever cases, consisting largely of cereals, milk, broths, etc., food which is nourishing and easily digested, and plenty of water. It is especially important, however, to limit protein foods as much as possible, to lessen irritation of the kidneys, since kidney complications are common.

Treatment of Complications: Nephritis is the most common complication and the one which the nurse should guard against. When an acute nephritis develops the patient is kept in bed even if the temperature is normal. He should be kept warmly dressed with plenty of flannels. A milk or a low protein diet is ordered and various articles of food such as fruits, bread, cereals, etc. are added gradually. The daily output of urine is recorded and its character noted. Some physicians have the nurse test the urine for albumin daily. The general treatment of acute nephritis will be described under that disease.

Otitis media and mastoiditis are treated by the usual medical or surgical measures for such conditions. Cardiac complications may be avoided by early treatment with scarlet fever antitoxin and when they develop they are treated in the same manner as other cardiac complications, which will be described later.

Desquamation: Desquamation or peeling is usually treated by anointing the skin to prevent scattering the flakes. Various plain or antiseptic ointments are used for that purpose. If there is any discharge or any slight scaling the patient should be quarantined until this has completely disappeared, since discharges from wounds, nose or throat or peeling flakes transmit the disease.

CHAPTER V

CONTAGIOUS DISEASES

Contagious diseases are those infectious diseases which can be transmitted by indirect contact; that is, without coming in contact with the patient or any of his discharges. They may be transmitted, however, by the patient's secretions or discharges as well. The cause of most contagious diseases is unknown, but they are evidently infectious in nature because their symptoms are similar to those infectious diseases caused by germs. When the cause of a contagious disease is discovered it usually proves to be a germ. Scarlet fever, for example, was always considered a contagious disease but it has recently been proven to be a specific toxemia caused by a type of Streptococcus hemolyticus.

Eruptions

Most contagious diseases are characterized by the appearance of a typical rash or eruption in the course of the illness. The diagnosis is made principally by the character of the rash. The eruption usually develops on mucous membranes as well as on the skin; but it occurs on the mucous membrane first. For example, in scarlet fever the marked acute inflammation or angina in the throat appears before the eruption. In measles, the Koplik spots appear on the mucous membrane on the inner side of the cheek a day or two before the rash appears on the skin.

In observing a rash the nurse should note the following points:

1. The color.
2. The extent.
3. The character.

Color: The color of most rashes is usually some shade of red, which varies with the disease. In some skin diseases eruptions of other colors occur.

Extent: A rash may be localized to one area or it may spread to other parts of the skin. A discrete rash is an eruption with well-defined borders. A diffuse rash is an eruption in which the borders are not made out easily. A confluent rash is a rash in

which several spots fuse together, forming a more extensive eruption.

The Character: Every eruption is usually classified according to certain original or primary spots or lesions of which it is made up. The following are the most common fundamental constituents of every eruption:

1. macule.
2. papule.
3. wheal.
4. vesicle.
5. pustule.
6. bulla.
7. petechia, hemorrhage or ecchymosis.

A macule is a small discolored area of skin, usually red in color, which is not elevated from the surface. It may be small or large. For example, in scarlet fever the entire skin is covered by large red patches which are not raised above the surface of the rest of the skin. The rash is therefore called a macular rash.

A papule is a small discolored area of skin which is slightly elevated above the surface.

A wheal is an area of skin which is considerably elevated from the surface. It is swollen and usually white in color. Urticaria or hives is the disease which is characterized by a rash consisting of wheals.

A vesicle is a small or large blister and a rash characterized by the presence of vesicles is called a vesicular rash.

A pustule is a small or large blister which contains pus. A pustular rash is a rash which consists of pustules.

A bulla is a large blister and a bullous rash is a rash consisting of large blisters or bullæ.

A petechia, hemorrhage or ecchymosis is a black or blue area of skin which contains blood that has oozed from the capillaries or other blood vessels. A petechia is a tiny speck of blood which has oozed from a capillary and a rash which consists of petechiæ is usually called a petechial rash. A hemorrhage or ecchymosis is a large spot, the usual black and blue spot. A rash which consists chiefly of hemorrhages or ecchymoses is called a hemorrhagic or ecchymotic rash.

In contagious diseases this type of rash usually occurs in the severest forms of the disease.

Course of Eruptions: An eruption may develop suddenly at the onset or appear gradually in the course of a disease. In

scarlet fever the rash appears suddenly on the second day of the illness, while in typhoid fever it appears during the second week. Some eruptions begin in one form and then change their character. The original character of the rash is called the primary form or primary lesion. When a rash changes its character in the course of a disease it may start as a macule or a papule and then develop into a vesicle or pustule. The reverse order seldom occurs. Vesicles frequently become pustules because the contents of the blister are changed to pus by infection with bacteria which are constantly present in the skin.

A rash may also change its shape; for example, it may be discrete at first and later become confluent or diffuse.

Desquamation: Desquamation is peeling of the skin which occurs at the end of a contagious disease characterized by a rash. The peeling may occur in the form of fine flakes or entire pieces of skin may be shed. As a rule the extent of the desquamation is in proportion to the extent of the rash, that is, the more extensive the rash, the more extensive is the desquamation. The character of the desquamation varies with different diseases. For example, in measles, peeling occurs in tiny flakes, while in scarlet fever it occurs in large flakes of skin. A vesicle or pustule usually forms a crust when its contents are discharged and dry. The crust then desquamates.

During desquamation it is essential to anoint the skin with some antiseptic ointment to prevent scattering the flakes or crusts which frequently contain the infectious element.

MEASLES OR RUBEOLA

Measles, Morbilli or Rubeola is an acute, contagious and infectious disease characterized by a specific rash and a tendency to affect the upper air passages.

Cause: The specific cause of measles is unknown, but it is probably caused by a germ. The disease occurs especially in children and infants under five years of age and in all climates. It is rare in adults, probably because most adults are immune as the result of having had the disease in childhood. It is always prevalent, but it occurs in epidemics at frequent intervals, especially in boarding schools or army camps.

The disease is especially contagious in the early stage, when the patient has discharges from the nose, throat and bronchial tubes. The dried secretions from the nose, throat, and the expectoration probably transmit the infection.

Pathology: The structural changes in measles are a characteristic rash and evidence of acute inflammation in the lungs, the skin and in the lymph nodes.

Symptoms

The symptoms of measles may be divided into three groups: (1) prodromal symptoms, (2) a characteristic rash, (3) fever.

The incubation period varies from seven to eighteen days, but it is usually about fourteen days.

Prodromal Symptoms: The prodromal symptoms are the symptoms which occur before the onset of the disease. The patient has red, inflamed eyes (conjunctivitis), a mucous discharge from the nose (coryza), attacks of sneezing, or a cough with expectoration, for three or four days or a week. The tongue is coated and the mucous membrane of the mouth and throat is inflamed. These symptoms are sometimes associated with slight temperature and a rapid pulse. The temperature may subside for a day or two, but it soon rises again but not to a very high degree. The disease now becomes evident by characteristic Koplik spots in the mouth followed by an eruption.

Koplik's spots are tiny red spots with a whitish speck in the center about the size of a pinhead. They may be seen on the inner side of the cheek opposite the second molar teeth. They occur during the latter part of the prodromal stage or a day or two before the eruption appears.

The Eruption: The rash appears on the second to the fourth day of the illness. It is dark red in color and appears first on the forehead or behind the ears at the roots of the hair. It then spreads to the face, the arms, the chest and lower extremities. At first the rash consists of tiny red spots which are slightly elevated from the surface (papules). These spots gradually increase in size, forming large, blotchy, slightly elevated areas separated by areas of normal skin.

The rash is associated with the symptoms of fever: a rapid pulse, a feeling of illness, loss of appetite, and dryness of the skin. The temperature ranges around 102° or 103° F. and usually lasts about four to six days, when it gradually subsides, unless complications develop.

Throat Symptoms: The tonsils are usually swollen but they have no characteristic appearance, and the glands in the neck are usually swollen and tender.

Desquamation: The eruption lasts three or four days and

then it begins to peel, usually in small tiny flakes. The desquamation is complete in about a week; except in severe cases, when it takes several weeks. It is accompanied by gradual convalescence.

Unusual Forms of Measles: There are a number of unusual types of measles: malignant or black measles, a mild form, and an abortive form.

Malignant or black measles is a very severe form characterized by a rash with tiny hemorrhages into the skin, a very high fever with intense toxic symptoms, shortness of breath, cyanosis and severe prostration and weakness, with death in a few days.

A mild or attenuated form is a short illness lasting four or five days.

An abortive form of measles has no eruption but only persistent cough, expectoration and temperature.

Complications

The most common complications are bronchitis, bronchopneumonia, ear complications and conjunctivitis.

Bronchitis with persistent coughing may last for some time after the attack has subsided.

Bronchopneumonia is one of the most serious complications and may be fatal.

The ear complications usually occur at the height of the disease from extension of the infection from the nose and throat to the middle ear. Sometimes the drum membrane of the ear ruptures spontaneously and pus is discharged from the ear. There may be a chronic discharge from the ear for some time after the illness. In severe cases the ear infection extends to the mastoid bone, causing mastoiditis.

Conjunctivitis, an inflammation of the mucous membrane of the eyelids, is a common complication and may persist after the measles has subsided.

Scarlet fever and measles sometimes occur together.

Sequelæ: Whooping cough and tuberculosis occasionally follow measles and care should be taken during convalescence to prevent their occurrence.

Treatment

The methods of treatment are prevention, isolation, nursing care, and symptomatic treatment.

Preventive Treatment: Measles may be prevented by avoid-

ing contact with active or convalescent cases, especially those who have a discharge from the nose or a wound. It is a common notion among some mothers that it is best to expose children to measles to let them contract the disease and be over with it. This idea is not to be countenanced because it is based on the assumption that measles is a mild illness, unattended with any serious difficulties. The disease may be mild in one child, but when this mild form is transmitted to another, it may run a virulent course with complications.

Isolation: The patient is isolated and kept in bed until a few days after the fever has subsided, unless complications develop. The usual measures of quarantine are carried out, such as the use of separate linens, separate dishes, scrupulous care to prevent spreading the infection, etc. The patient is usually quarantined until about ten days after the disappearance of the rash, or until there are no discharges from the ear, the nose or throat, or until the cough and expectoration have subsided.

Nursing Care: Nursing in measles requires constant care of the nose and throat to avoid ear complications, care of the eyes to prevent eye complications, and proper care of the rash. When the rash is slight, hot drinks or baths will sometimes bring it out. To avoid eye complications the room should be kept dark, since light is very irritating. During the period of desquamation the skin should be anointed with various plain or medicated ointments to prevent scattering the flakes.

Symptomatic Treatment: The fever is treated by the usual fever diet, and by various cold sponges to reduce the temperature when it is excessive. The nose is kept free of discharge by dropping normal salt solution or albolene into it. Alkaline gargles are ordered for the throat. Conjunctivitis is treated by antiseptic eye lotions. For the bronchitis the physician usually prescribes various cough medicines.

GERMAN MEASLES

German Measles, Rubella, or Rötheln, is a mild infectious disease characterized by a rash which may resemble measles or scarlet fever.

Cause: The cause of the disease is unknown, but it is apparently an infectious disease which affects principally younger children and occasionally adults.

Pathology: The disease is an acute infectious disease with a rash and enlargement of lymph glands.

Symptoms

The incubation period is from two to three weeks. The symptoms may be divided into prodromal symptoms, a rash, and the symptoms of fever.

Prodromal Symptoms: The patient may have chilly sensations, headaches, pains in the back and legs, a discharge from the nose, occasionally a cough and enlargement of all the lymph nodes for a few days before the onset.

The disease begins with fever, followed by an eruption. The temperature is usually slight, seldom rising above 100° F.

The Eruption: The rash usually appears within the first three days of the illness. It may resemble the eruption of measles or that of scarlet fever, but it is not typical for either. When the rash resembles measles, it is brighter in color and the individual spots are not elevated. It is more confluent than in measles. It occurs first on the face, then extends to the extremities and rest of the body. The rash is irregular, so that small individual spots and larger coalescent areas may occur at the same time.

When the rash resembles scarlet fever it is not a generalized redness, but more blotchy in character, and the skin is stained when it disappears. The rash lasts only a few days, then it gradually fades and disappears.

The characteristic feature of the disease is the unusual extensive enlargement of all the lymph nodes. There are usually no complications.

The disease is treated like measles and the patient is usually isolated only for a very short time.

DUKE'S DISEASE OR FOURTH DISEASE

Duke's disease is a disease similar to German measles. It is characterized by a rash which is bright red in color like scarlet fever. It does not affect the face, however, and it desquamates more than German measles does.

SMALLPOX OR VARIOLA

Smallpox or variola is an acute infectious and contagious disease characterized by a specific rash. It is one of the oldest diseases known and was prevalent among the Egyptians, since many of the mummies show pock marks, a characteristic sequel

of the disease. It was especially prevalent in the Middle Ages and would occur in severe epidemics, killing thousands of people.

Smallpox is one of the most fatal and most contagious diseases, but it is now very rare, owing to the general use of vaccination. Occasionally mild epidemics develop especially when a large group of people live in crowded quarters as in army camps during war times. Persons who have not been vaccinated almost invariably develop the disease when exposed to it, while those who have been vaccinated are usually immune.

Cause: The cause of smallpox is unknown, but it is evidently an infectious and contagious disease. The infectious agent is present in the dried crusts of the rash, in the nasal secretions and in the sputum. The dried crusts may form a powder and become attached as dust to clothing and various other articles. The disease is usually transmitted by an unrecognized case or by persons who have been in contact with cases of smallpox.

Pathology: The structural changes of the disease are the characteristic rash on the face, the body, in the mouth, palate, pharynx, and larynx. The spleen is considerably enlarged and there are other structural changes in various organs.

Symptoms

The incubation period is from nine to fifteen days; it is usually about twelve days. The symptoms may be divided into the following three stages:

1. The Stage of Invasion and Initial Fever.
2. The Stage of Eruption and Remission of Fever.
3. The Stage of Pustulation and Secondary Fever.

Stage of Invasion: The onset is sudden, beginning in adults with a chill or several repeated chills, and in children with convulsions. The patient has severe pain in the back, headache, and vomiting. The pain in the back is especially marked. The temperature rises to 103° and 104° F., the pulse is rapid and all the symptoms of fever become manifest; especially nervous symptoms, such as restlessness and delirium. The face is flushed, the skin is dry and the patient sweats profusely. During the onset a rather extensive rash may be present on the abdomen or inner part of the thighs or on the thorax. It is of a bright red color and may resemble the rash of scarlet fever.

Stage of Eruption and Fever Remission: This stage is characterized by a typical eruption and a drop in the temperature. The rash of smallpox occurs on the third or fourth day of the

disease. It consists of small elevated red spots (papules) which are rather firm and hard and feel like small buckshot. The eruption occurs on the face, forearms and wrists; and to a less extent on the chest and abdomen, where it is often absent entirely. The temperature usually subsides when this rash appears. In a day or two, that is, on about the fifth or sixth day of the illness, the small elevated spots form small round blisters or vesicles containing clear serum. The blisters have a depression or tiny dimple in the center, hence they are called umbilicated vesicles. This is a characteristic feature of the smallpox rash. In severe cases the rash may occur in the throat, mouth or larynx.

Stage of Pustulation and Secondary Fever: At about the eighth day of the disease the blisters or vesicles become changed to pustules as the result of infection by the bacteria of the skin. The base of the pustules and the areas of skin between them are red and inflamed. As a result of the development of pustules the temperature again rises to 103° or 105° F. This is known as the secondary fever, and lasts a few days or longer. It is associated with severe toxic symptoms: delirium, thirst, excessive flow of saliva and diarrhea. The delirium may persist even after the fever has subsided. In severe cases the patient may go into coma and die.

Dessication: The pustules gradually break and the pus oozes out, forming dry crusts. In about two or three weeks nearly all the pustules become crusts and the fever subsides. The crusts fall off, leaving small depressions or pits in the skin, which give the characteristic pock-marked appearance of persons who have had smallpox.

Uncommon Forms of Smallpox

The unusual forms of smallpox are the confluent, the hemorrhagic and the mild form.

Confluent Form: This is a severe form in which the rash consists of groups of pustules fused together with severely inflamed, swollen skin in between.

Hemorrhagic or Black Smallpox: This form is associated with very severe toxic symptoms and is very often fatal. The eruption is characterized by hemorrhages into the skin or into the pustules. Sometimes blood also occurs in the urine.

Varioloid: This is a mild form of smallpox which occurs in persons who have been vaccinated, but so long ago that they are no longer immune. It begins in the usual way, but the symptoms

are mild. The pustules are very few and the rash is confined to the face and wrists. The general symptoms and fever are slight. The rash disappears rapidly, rarely leaving pits. This form of smallpox is frequently unrecognized and may be the means of transmitting the disease.

Complications

Although smallpox is a very severe infection it produces few complications. The most common complications are conjunctivitis, ear infections and bronchopneumonia.

Conjunctivitis is common, but is usually mild. Occasionally a severe form occurs with an extensive infection of the conjunctiva and cornea, which causes a purulent discharge. It may be followed by ulceration of the cornea or by adhesions of the eyelid to the cornea of the eye.

Middle ear infection results from extension of the infectious process to the middle ear. Sometimes the ear drum ruptures spontaneously, producing a purulent discharge from the ear.

Bronchopneumonia is the most serious complication of the disease and is responsible for the fatal outcome of many of the cases.

The rare complications are skin infections such as extensive boils or gangrene of areas of skin.

Treatment

The methods for treating smallpox are prevention, isolation and symptomatic treatment.

Preventive Treatment: Smallpox may be prevented by vaccination at frequent intervals and during an epidemic, and by early recognition and isolation of mild and atypical cases. Epidemics usually start from mild cases which are not recognized. The patient may walk about during the stage of remission when there is no fever and transmit the disease to others. The rash of the mild cases may resemble chicken-pox for which it is sometimes mistaken. The essential points of difference between the eruption of chicken-pox and smallpox are the following: Chicken-pox appears on the body while smallpox occurs principally on the face. Chicken-pox is common in children while smallpox occurs in adults. In chicken-pox vesicles and pustules in all stages occur at the same time. In smallpox vesicles occur in one stage while pustules occur in another. When chicken-pox occurs on the face, especially in an adult, smallpox should always be suspected.

Vaccination: Vaccination is the most effective means of pre-

venting smallpox. Every child should be vaccinated in infancy and every one should be revaccinated about every seven years. The prevention of smallpox is one of the greatest accomplishments of modern medicine. As the result of general vaccination, only a few cases of smallpox occur in a year in a large city like New York. When we compare the terrible epidemics of smallpox in the Middle Ages, which killed hundreds of thousands of people, with the rarity of the disease to-day, we have conclusive evidence of the efficacy of vaccination. During an epidemic the entire community should be vaccinated. A successful vaccination may prevent an attack of smallpox even when done as late as four days after exposure to the disease.

Isolation: Smallpox cases are usually treated in special hospitals under the strictest isolation and quarantine. The nurse and attendants should wear gowns and caps, rubber gloves and boots or rubbers. The usual methods for isolation should be carried out in the strictest possible manner. Every one who comes in contact with the patient or who enters the hospital should be vaccinated.

Symptomatic Treatment: The treatment consists in the care of the eruption to prevent extensive pitting, the treatment of fever and the use of methods and remedies to make the patient comfortable and relieve the delirium.

The eruption is usually treated by applying gauze immersed in various antiseptic solutions such as phenol or bichloride of mercury. The face is sometimes covered with gauze and oiled silk. The formation of vesicles is sometimes hastened by exposing the patient to sunlight or artificial sunlight. When the odor is particularly bad continuous warm baths of antiseptic solutions are used. Scratching should be prevented as it often causes deep pitting. When the rash occurs in the throat various antiseptic gargles are used. It is especially important to keep the eyes clean by frequent irrigations with normal salt solution or with boric acid solution, to prevent extensive inflammation. The fever is treated by coal-tar drugs and by cold sponges. The diet is the usual light diet of fever with plenty of water. When the patient is delirious morphine or bromides are given. During convalescence oil, glycerin or antiseptic ointments are applied to soften the crusts.

VACCINIA

Vaccinia or cowpox is a disease of cattle characterized by the formation of pustules around the udder, and mild symptoms of

fever. It is believed to be a mild form of smallpox which has become weakened by continually affecting resistant animals.

Vaccination is a method of producing immunity to smallpox. It consists of artificially producing a pustule on the skin by inoculation with the contents of cowpox or vaccine pustules.

Sir Edward Jenner, who introduced vaccination, observed that persons working around cattle would sometimes get a mild attack of cowpox. When such persons were subsequently exposed to smallpox they did not contract the disease. He therefore conceived the idea of producing immunity to smallpox by artificially causing an attack of cowpox by means of vaccination with the pus of the pustules of cowpox.

Technique of Vaccination: Several scratch marks are made on the skin with a sterilized needle and a few drops of smallpox vaccine or vaccine virus are then applied on this area and allowed to dry. The smallpox vaccine is the serum obtained from the postules on the udders of healthy calves who have been inoculated with the pus of affected calves. A small glass tube containing a sterilized needle for making the scratch marks usually comes with the vaccine.

Effect of Vaccination: About the third day after vaccination the vaccinated spot becomes red and slightly elevated. The inflamed area gradually becomes larger until the fifth or sixth day, when a definite blister forms. The blister or vesicle is usually indented in the center (umbilicated) and its border is raised. It gradually becomes larger and by the tenth day it becomes filled with pus, and the surrounding area of skin becomes rather hard and swollen. The inflammation subsides and the pustule finally forms a thick scab, which eventually dries and falls off, leaving a depressed, pitted scar.

Vaccination is usually accompanied for a few days by a slight temperature, headache and a feeling of illness. The glands in the axilla, if the arm has been vaccinated, or the glands in the groin, if the leg has been vaccinated, become swollen. The patient usually complains of itching, especially when the blister forms.

The immunity to smallpox produced by vaccination begins to develop in three weeks and lasts about twelve years. Vaccination should be repeated about every seven years. Sometimes vaccination does not develop the usual changes; that is, does not take; but a small red elevated spot forms instead. When repeated vaccinations do not take, the person is probably immune.

When a person who has recently been vaccinated is exposed to smallpox during an epidemic, he may escape an attack entirely. Sometimes, however, he may contract smallpox in spite of an effective vaccination; but the disease then runs a very mild course.

Complications of Vaccination: Vaccination usually runs a normal course, but it is occasionally followed by urticaria or hives, infection or erysipelas.

The vaccination occasionally extends to the surrounding skin, forming small blisters similar to the original one.

Urticaria or hives occasionally develops and causes a good deal of itching.

If the vaccine has not been carefully prepared, or if the patient scratches the vaccinated area, the arm may become infected, or erysipelas may develop. This produces the characteristic local signs of infection, associated with high temperature and the usual symptoms of fever.

Tetanus is a very rare complication which results when the vaccine has not been properly prepared.

Care of Vaccination: The vaccinated spot should be exposed to the air until it is dry. A small piece of sterile gauze is then applied over the area and held in place with adhesive plaster. Sometimes a piece of gauze is sewn to the inner side of the sleeve. Shields, especially metal shields, should be avoided, since they rub against the vaccination mark, irritate it and may cause infection.

CHICKEN-POX OR VARICELLA

Chicken-pox or varicella is an acute infectious and contagious disease characterized by a rash consisting of tiny blisters and pustules. It is a very mild disease and is not accompanied by any serious constitutional symptoms.

Cause: The cause is unknown, but the disease occurs especially in children.

Symptoms

The incubation period is from ten to fifteen days, usually about two weeks. The disease begins with a slight chill, vomiting, pain in the back, and a slight rise in temperature. The fever lasts two or three days. On the second day a characteristic rash develops.

The Eruption: The rash begins with the appearance of groups of small red papules which rapidly form small blisters containing a slightly cloudy fluid. In thirty-six to forty-eight hours the

contents of the blisters change to pus. The pustules shrivel up and in a few days they form brown crusts which fall off without leaving any scar.

The rash appears first on the back or front of the chest. It seldom involves the face or arms, although a few spots appear on the face occasionally.

The eruption differs from smallpox as follows: There is no central depression in the blisters and the skin around them is not inflamed. The rash occurs on the trunk or chest and not on the face and arms. Vesicles and pustules occur at the same time in all stages, while in smallpox vesicles appear in one stage and pustules in another.

The disease is not serious, but it is very contagious. It seldom produces any complications. Pitting is very rare and occurs only when some of the pustules are large and badly inflamed. It may leave slight pock marks like smallpox.

The treatment consists of isolation for about ten days to prevent spreading the infection to other children.

MUMPS OR EPIDEMIC PAROTITIS

Mumps or epidemic parotitis is a mild, acute, infectious and contagious disease characterized by swelling of the salivary glands and by inflammation of the testes or ovaries.

Cause: The cause of the disease is unknown. It is essentially a disease of childhood and adolescence, and occurs especially in the spring and fall. It frequently occurs in epidemics, in boarding schools or wherever large groups of children are together.

Symptoms

The incubation period is from fourteen to twenty-one days. The disease begins suddenly, with a slight sore throat.

The parotid glands become inflamed and swollen, producing a marked visible swelling at the angle of the jaw, just below the ear, first on one side and then on the other. The swollen glands are painful and the child is sometimes unable to open its mouth. The lymph glands at the angle of the jaw and in the neck are also swollen. There is usually a slight rise in temperature, about 100° to 101° F., for a few days.

Complications: In boys the testes often become inflamed. The inflammation is sometimes quite severe, and is associated with high temperature. In girls the ovaries become inflamed, which causes pain in the lower part of the abdomen. Sometimes

the inflammation of the testes or ovaries produces permanent injury, a condition which may retard genital development in later life.

Inflammation of other glands such as the thyroid or pancreas, have been described as exceedingly rare complications.

Treatment: The patient is isolated and kept in bed. The food should consist of liquids since opening the mouth is sometimes very painful. The bowels are usually moved freely by cathartics and if the temperature is sufficiently high remedies are used to reduce the fever.

An ice bag or various ointments such as ichthyol, belladonna, etc., are applied over the cheek or neck to relieve the swollen glands.

The inflamed testes are treated by applying an ice bag or various ointments. When an inflammation of the ovaries is suspected, an ice bag is applied over the lower part of the abdomen.

WHOOPING COUGH OR PERTUSSIS

Whooping cough or pertussis is an acute infectious and contagious disease caused by the Pertussis bacillus. The disease is characterized by severe spasms of coughing which terminate in a prolonged whoop, hence its name.

Cause: The specific cause is the Pertussis bacillus, which was recently discovered by Bordet and Gengou. The germ occurs in the mucus expectorated during a spasm of coughing. The disease affects young children; especially those under five or six years of age. It sometimes occurs in adults and in old people in whom it is usually quite serious. Whooping cough epidemics are especially common during the spring or winter; but cases are always more or less prevalent. The disease is transmitted by the expectorated mucus especially in the first few weeks of the illness.

The disease is a specific infection of the lungs, but it is grouped with the contagious diseases to emphasize its contagious nature and prevalence in children.

Symptoms

The incubation period is from seven to ten days. The symptoms may be divided into two stages: a catarrhal or prodromal stage and a paroxysmal stage.

Catarrhal Stage: The catarrhal or prodromal stage lasts about ten days. It consists of a "cold" with a mild bronchitis asso-

ciated with slight temperature. The cough gradually gets worse and finally becomes spasmodic in character.

Paroxysmal Stage: The second or paroxysmal stage lasts from six weeks to three months or more. It is characterized by paroxysms of coughing lasting a few minutes or longer. The spasm consists of a series of coughs of increasing severity; during which the face gradually becomes blue, the eyes protrude and the veins of the face and neck stand out prominently. Finally the child takes a long, deep, crowing breath, lets out a whoop, and the attack is over.

Occasionally there are a series of attacks, with mucus expectoration; but usually the cough is dry. The attacks may be brought on by crying, by exertion, by food or by irritation in the throat and sometimes without any apparent cause. Some children vomit during the attack and in younger children there may be more vomiting than coughing. As a result of continued vomiting and coughing the child frequently loses weight and becomes emaciated.

The disease lasts about six weeks or longer, sometimes several months. The attacks gradually diminish in frequency and severity and the patient finally recovers. Sometimes an occasional spasmodic cough may occur for months afterward, especially at night.

Unusual Forms: The symptoms are often unusual in old people and in mild cases. In old people fainting attacks may occur instead of spasms of coughing. In mild cases the spasms occur only at night and severe attacks are absent.

Complications: A severe paroxysm of coughing may rupture a blood vessel and cause a hemorrhage. Nosebleeds, or hemorrhages into the conjunctiva of the eye are common. A hemorrhage in the brain sometimes occurs, especially in old people. This may cause a paralysis of an arm or leg, or convulsions. Bronchopneumonia is one of the most serious complications of the disease.

Sequelæ: Pulmonary tuberculosis often develops after whooping cough, especially when the course has been long or severe.

Treatment

The treatment consists of preventive, specific and symptomatic methods and isolation.

Preventive Treatment: Every child with whooping cough should be kept away from other children, especially in the first or prodromal stage, which is very contagious. Unfortunately, however, the disease is usually not suspected at this time.

Pertussis vaccine is now used extensively to prevent whooping cough. It is given by hypodermic injection in doses of 500 million to 2 or 3 billion bacilli every third day. There is considerable difference of opinion as to its efficacy, but many physicians believe it is effective.

Specific Treatment: Many physicians give injections of pertussis vaccine during the illness in doses of 500 million bacilli every other day to children under one year and 1 billion bacilli to older children. It is believed to lessen the severity of the attacks and shorten the duration of the illness.

Isolation: The patient should be isolated as soon as the nature of the disease is established. The child need not be kept in a separate room but should be allowed outdoors away from other children, except those who have already had the disease.

Symptomatic Treatment: This consists principally of methods and remedies to relieve the paroxysms of coughing. Fresh air is the best remedy to prevent attacks. The child should be kept outdoors all day long and allowed to have plenty of fresh air at night. In the winter the child should wear light woolen clothing or underclothing to prevent pneumonia. It is better to send the child to the country, even in the fall or winter. Some children can be taught to prevent the attacks. A tight binder applied to the abdomen will occasionally lessen the frequency of attacks.

Steam inhalations with benzoin, oil of pine needles, and similar substances are frequently given under an improvised tent. The remedies commonly ordered are atropine, morphine, codeine, heroin, antipyrine, chloral hydrate, bromides, luminal, terpin hydrate, and sodium bicarbonate or other alkalies.

The loss of weight and emaciation which often follows continued vomiting and coughing is treated by plenty of nourishing food and tonics, such as iron preparations, cod liver oil, etc.

GLANDULAR FEVER

Glandular fever is a mild, acute, infectious disease which occurs in children.

The symptoms consist of a fever and enlargement of all the lymph glands in the body, especially those in the neck, the armpits and the groin. The temperature is usually slight and lasts a week or ten days.

The disease requires no treatment as the patient usually recovers.

TABLE OF COMMON CONTAGIOUS DISEASES

Disease	Cause	Incubation Period	Onset	Prodromal Symptoms	Throat	Eruption	Complications
Measles	Unknown	7 to 18 days, usually 14	Gradual	Coryza, conjunctivitis, cough and expectoration.	Koplik Spots	Appears on 2d to 4th day; dark red papules behind ears; face, arms, chest and extremities.	Bronchitis, Bronchopneumonia, ear complications, conjunctivitis. Whooping cough or tuberculosis may be sequel.
Scarlet Fever	Streptococcus Hemolyticus	1 to 7 days, usually 4	Sudden, with vomiting or convulsion.	None	Angina (intense redness) of throat. Strawberry tongue.	Appears on 2d day. Scarlet red, first on neck and chest.	Nephritis, Arthritis. Throat and ear complications. Adenitis.
Diphtheria	Diphtheria Bacillus	1 to 5 days	Sudden	None	Membrane on tonsils, throat or in the nose.	None	Heart complications, paralysis of palate.
German Measles	Unknown	2 to 3 weeks	Sudden or gradual	Chilly sensations, headache, pain in the back and legs or coryza.	Not characteristic	Appears during first 3 days. May resemble scarlet fever or measles.	None
Smallpox	Unknown	9 to 15 days, usually 12	Sudden	Stage of invasion and initial fever; chill or convulsion, pain in back, headache, vomiting and fever.	Characteristic rash in severe cases.	Appears on 3d or 4th day. Small papules changing to "umbilicated" vesicles on face, forearms and arms. Temperature subsides, secondary rash of pustules with secondary fever.	Conjunctivitis. Ear infections, Bronchopneumonia, Pitting.
Chicken-pox	Unknown	10 to 15 days, usually 2 weeks	Sudden	None	None	Papules changing to small blisters on back and chest in 36 hours.	None
Mumps	Unknown	14 to 21 days	Sudden	None	Swelling of salivary gland in front of ear.	None	Inflammation of ovaries, testes and other glands.
Pertussis (Whooping Cough)	Pertussis Bacillus	7 to 10 days	Gradually	Catarrhal stage of cough and bronchitis.	None	None	Nosebleed, hemorrhages, vomiting. Tuberculosis a frequent sequel.

CHAPTER VI

SPECIFIC INFECTIONS OF INTESTINAL TRACT

TYPHOID FEVER

Typhoid fever is an acute specific infectious disease caused by the Bacillus typhosus of Eberth. It is also known as Enteric Fever or Typhus abdominalis, to distinguish it from Typhus fever or Typhus exanthematicus. It is essential for the nurse to have a thorough knowledge of this disease because the nursing care is the most important part of the treatment.

Cause: The disease is caused by the Typhoid bacillus, a short, thin bacillus which can be seen moving about when a drop of a typhoid culture is examined with a microscope. It is more prevalent in young people, especially between the ages of fifteen to twenty-five. It is more common in the fall, hence the disease is sometimes called Autumnal Fever. Typhoid fever is essentially a disease of poor sanitation and consequently occurs more often in the country than in large cities.

Transmission: The disease is transmitted by contaminated water, food, especially shell fish and milk, and by "typhoid carriers." Typhoid fever may result from drinking the water or using the ice of a stream or well which has become contaminated by the stools of a typhoid fever patient or a typhoid carrier. It may also develop from eating oysters or other shellfish which have been grown or "fattened" in a contaminated stream. Sometimes the disease results from drinking milk contaminated by a typhoid carrier who is employed in milking or handling milk.

Carriers: Carriers are persons whose stools contain living typhoid bacilli as a result of a previous attack of typhoid fever. They are therefore a common source of infection, especially when employed as cooks, waiters, dairymen or in other occupations in which food is handled.

Direct Personal Transmission: Typhoid fever is sometimes transmitted by actual contact with the patient or his excretions when insufficient care is taken to prevent spreading the disease. Flies may carry typhoid bacilli from the stools, urine or dishes of the patient to other patients or to normal persons. Linens or

dishes that have not been properly sterilized are another source of direct transmission from the patient. The nurse or physician may contract the disease if they do not sterilize their hands when handling typhoid patients.

Pathology: The typhoid bacilli enter the body through the intestinal tract in contaminated food or water. They penetrate the wall of the intestines and enter the blood stream, where they grow and multiply rapidly. The germs finally disappear from the blood in about two weeks and lodge in the intestinal tract, especially in the Peyer's patches or lymph follicles in the small intestine. The follicles and the lymph glands draining them become swollen and inflamed and some of the patches become ulcerated. These ulcers in the small intestine are the characteristic structural changes in typhoid fever. In the process of ulceration blood vessels may be opened and hemorrhage results. Sometimes the ulcers are so deep that they extend through the intestinal wall, causing a perforation. The spleen is usually inflamed and enlarged and other organs such as the heart, liver, blood vessels, nervous system, and kidneys are also inflamed.

Symptoms

The incubation period is from eight to fourteen days, but it has been known to be as long as twenty-three days; it is usually about ten days. The symptoms may be divided into two stages: prodromal symptoms, and the symptoms manifested during the course of the disease.

Prodromal Symptoms: Typhoid fever begins very gradually with mild, rather indefinite symptoms for about a week. These symptoms are so mild that they give no indication of the severe infection that they initiate. The patient complains of a general feeling of fatigue which gets steadily worse, laziness or inaptitude for work, and sometimes headache, nosebleeds, pain in the lower part of the abdomen, and constipation or diarrhea. The temperature gradually rises from day to day, being about a degree higher every evening. The pulse is usually normal or even slow. The symptoms grow steadily worse, and the patient becomes so ill that he has to go to bed.

Course: The essential symptoms of typhoid fever are a continuous fever associated with a characteristic apathy known as a "typhoid state," and intestinal symptoms. The fever lasts three weeks or longer, and the symptoms get worse from week to week. At the end of that time the temperature subsides by lysis and convalescence is established gradually.

Symptoms of the First Week: During the first week the patient still complains of many of the prodromal symptoms, but he becomes more dull and listless. The temperature gradually rises, reaches 103° or 104° F., and the pulse is full, of normal rate or even slow. The tongue is coated and the abdomen is distended and somewhat tender. There are usually no objective signs at this time, but in some cases, at the end of the week, the characteristic rash may appear.

Symptoms of the Second Week: During the second week the temperature persists; but it is usually higher than in the first week. It is more continuous in character; that is, the morning and evening temperatures do not vary much. The pulse now becomes more rapid and frequently develops a dicrotic character. The patient becomes more and more apathetic and gradually becomes dull and stupid. The lips and tongue are dry, the abdomen is distended, and occasionally there is diarrhea.

The definite signs of the disease now develop. In the early part of this week the characteristic rash appears, and the spleen becomes enlarged. The rash consists of tiny rose-colored spots ("rose spots") which disappear on pressure. They occur principally on the abdomen and sometimes on the back. They come out in small scattered crops. The spots are very evanescent; they last for a day or two and then disappear.

The physician is frequently able to feel the spleen below the border of the ribs.

Symptoms of the Third Week: In the third week the patient becomes still more dull and apathetic and is quite prostrated. The temperature continues at about the same height as in the second week, with the same or a greater tendency to remissions, and the pulse is rapid, 120 to 130. The abdomen becomes more distended and sometimes diarrhea occurs. The patient gets progressively weaker and loses considerably in weight. In severe cases the patient is delirious and mutters to himself. He has tremors of the hands and picks at the bedclothes, a symptom known as "subsultus tendinum." In mild cases the temperature begins to decline toward the end of the week.

Symptoms of the Fourth Week: In most cases convalescence begins during the fourth week. The temperature gradually subsides and finally reaches normal. The dullness and apathy diminish and the patient becomes interested in his surroundings. The tongue gradually becomes clean and the appetite returns.

During the subsequent weeks the patient's condition returns

rapidly to normal. He gains in weight and strength, the bowel movements become normal, and all the symptoms disappear.

Prolonged Course: Some cases of typhoid fever last five or six weeks or longer. The symptoms of the fourth and fifth weeks are merely a continuation of those of the third week. They are followed by the usual or prolonged period of convalescence.

Laboratory Evidence of Typhoid Fever

A positive diagnosis of typhoid fever can be made by examination of the blood, stools and urine. When the symptoms and signs are not typical these are the only methods by which the nature of the disease can be determined.

The Blood: The typhoid bacilli may be found in the blood, especially during the first ten days of the disease, by taking a culture of blood from an arm vein. They can also be found in a culture of a drop of blood from the "rose spots." The Widal reaction is a blood test for typhoid fever. It tests the ability of the patient's serum to agglutinate typhoid bacilli. A few drops of the patient's blood are taken and mixed with a drop of a pure culture of typhoid bacilli. If the patient has typhoid fever, the bacilli will stop moving about and will group together in small clumps. The Widal test is frequently reported positive in 1:50, 1:60 dilutions, etc. This indicates that the test is positive when the serum is diluted in these proportions.

The white blood cells are usually diminished in number and the percentage of the lymphocytes is relatively increased.

The Stools and Urine: The typhoid bacilli can be found in the stools or urine of the patient throughout the course of the disease. The rules of the Board of Health require that three successive examinations of the stools should be free from typhoid bacilli before the patient is discharged as cured.

Uncommon Forms

Typhoid fever sometimes runs an unusual course. The disease may begin in an atypical manner or uncommon symptoms may develop during the illness.

Unusual Onsets: The disease may begin suddenly with chills and fever. It sometimes starts with a chill, fever, cough and expectoration, like a bronchitis or pneumonia. Walking typhoid or Ambulatory typhoid is a form of the disease in which the

patient is up and about with fever for a week or two. The illness may not be recognized until a complication develops. A rare mode of onset is with delirium or convulsions or with the symptoms of acute nephritis.

Unusual Symptoms: The severe cases are usually very delirious. The patient is markedly prostrated, talks incessantly, has twitching of the hands and picks at the bedclothes. In some cases the temperature is unusual. It may begin with a chill, it may drop suddenly during the course of the disease, or it may subside by crisis.

Recrudescence is a recurrence of the temperature after it has already been normal for about a week or longer.

Complications

The most common complication of typhoid fever is tympanites. The most serious, although not the most common complications, are hemorrhage and perforation. The following are other complications which may occur in the course of the disease: relapse, phlebitis, cholecystitis, bronchopneumonia, acute nephritis, meningismus, cardiac complications, cystitis, bed sores, arthritis, periostitis, and typhoid spine.

Tympanites: Tympanites is a gradual and progressive distention of the abdomen due to distended intestines. The intestines become paralyzed by the toxins or poisons of the disease and are unable to expel gas. The degree of tympanites is usually an indication of the severity of the infection. Tympanites frequently causes abdominal pain, difficulty in breathing, and is a predisposing cause of hemorrhage and perforation.

Hemorrhage: Hemorrhage may be one of the most serious complications of typhoid fever. It occurs in from five to seven per cent of the cases. The extensive ulceration of the Peyer's patches in the intestines may open up fine capillaries or a large blood vessel and cause bleeding. Hemorrhage is apt to occur any time between the latter part of the second week and the end of the fourth week.

The symptoms may occur gradually or suddenly. The most important symptom of hemorrhage is blood in the stools, and this may be the only symptom. It is therefore essential for the nurse to examine every stool for blood and report its presence to the physician at once. If the bleeding continues the patient gradually becomes pale, feels weak and the pulse becomes rapid and weaker.

When the hemorrhage is extensive and sudden, the patient may have a fainting attack and go into collapse. Several hours later large clots of blood may be passed in the stools. Sometimes the blood appears in the stools first and the collapse develops afterward. If the bleeding is progressive, there may be a sudden drop of several degrees in the temperature, the pulse steadily becomes more rapid and weaker, the patient becomes very pale, complains of thirst and air hunger, and may die of collapse. When hemorrhage occurs in a delirious patient, the delirium may clear up suddenly.

Perforation: Perforation is the most serious complication of typhoid fever. It is the cause of death in about 25 to 30 per cent of the fatal cases. It results when the ulcers extend through the wall of the intestines. The perforation may be very small and develop slowly or it may occur suddenly. Sometimes several ulcers perforate simultaneously. Perforation is apt to occur in the severe cases, especially during the third week of the disease. It is frequently preceded by tympanites and hemorrhage.

The most important symptom of perforation is a sudden sharp severe pain in the abdomen which becomes rapidly worse. It usually occurs in the lower part of the abdomen. The pain may be paroxysmal in character; it may last for a few minutes and then improve. The patient may even fall asleep, to be awakened again by another sharp severe pain. The pain is very severe and characteristic and if the patient has had abdominal pain before the perforation this now becomes more severe. The abdomen becomes more distended and tender and the abdominal muscles become rigid. The temperature falls suddenly but soon rises again, and the pulse rate becomes steadily more rapid.

As the condition progresses peritonitis develops. The abdominal distention, the tenderness and rigidity of the abdominal muscles, and the temperature now steadily increase, and are accompanied by nausea, vomiting and sometimes by hiccough. The patient has a characteristic appearance known as Hippocratic facies. He looks anxious, the nose is pinched, and the nostrils dilate with the rapid respiration. The skin has a peculiar pallor and is cold, moist and clammy. The breathing is accompanied by visible movements of the chest because the abdomen is so rigid, and the pulse is very rapid and weak. Death may result unless operation is performed early.

Although the sudden sharp pain in the abdomen is usually the characteristic symptom, a perforation may also produce any of the following initial symptoms:

1. sudden vomiting between feedings.
2. sudden hiccough.
3. pain on urination.
4. sudden changes in temperature.

It is essential for the nurse to remember that a perforation may occur without producing the usual symptoms. Consequently, any sudden change in the patient's condition should make her suspect a perforation and the doctor should be notified at once.

Relapse: Relapse is a recurrence of the disease, which is usually due to a reinfection with the typhoid bacilli. After the temperature has been normal for a week or more it begins to rise again. It gradually reaches 102° or 103° F., rising about a degree each day. Some of the other symptoms of typhoid fever, the rash or roseola, and the enlargement of the spleen, also reappear. A relapse usually lasts a few days or a week, but seldom as long as the original illness.

A rise in temperature during convalescence does not always indicate a relapse. It may be caused by changing the diet too rapidly, by constipation, or by the development of any complication.

Other Complications

Phlebitis, an inflammation of a vein, often occurs in typhoid fever. The veins in the groin are usually affected. The symptoms are pain over the affected vein and a rise in temperature.

Cholecystitis, an acute inflammation of the gall bladder, is often produced by the typhoid bacilli. The symptoms are a sudden sharp cramplike pain in the right upper quadrant of the abdomen, radiating to the back or shoulder, nausea, vomiting and sometimes jaundice. The attack usually subsides, but chronic gall bladder disease often starts during typhoid fever.

Meningismus is a condition characterized by delirium, twitchings, coma, rigidity of the neck, which sometimes occurs in the course of the disease. The symptoms resemble those of meningitis and are relieved by removing fluid from the spinal canal.

Cardiac complications occur in severe cases as the result of involvement of the heart muscle. The pulse may become rapid and irregular. During convalescence the pulse is often weak and slow. Sudden death from heart failure is a rare complication.

Bronchopneumonia sometimes occurs at the onset, but in severe cases it often develops as the result of prolonged stay in

bed in the same position. It is therefore essential to change the patient's position frequently.

Cystitis, an inflammation of the bladder, is a very common complication, because the typhoid bacilli are continually excreted in the urine. The urine becomes cloudy and contains pus.

Acute nephritis, an inflammation of the kidneys, may occur in severe cases.

Bed sores are serious complications of typhoid fever, especially in prolonged cases. They usually develop as the result of continued pressure on parts of the body which are insufficiently covered with fat, such as the sacrum, hips, or heels. The patient may recover from a severe typhoid fever and finally succumb to a severe infection resulting from bed sores. The prolonged typhoid infection lowers the patient's resistance to such an extent that he becomes very susceptible to the development of bed sores. It is therefore especially important for the nurse to take scrupulous care of the patient's skin. When the disease is prolonged or severe, bed sores may be prevented by placing the patient in a water bed.

Typhoid spine is an inflammation of the spinal column produced by the typhoid bacilli, which occasionally develops during convalescence. The condition usually lasts a long time and is characterized by pains and stiffness in the lumbar and sacral region of the spine and pain on walking.

Arthritis, an inflammation of the joints, and periostitis, a form of inflammation of the bones, are other bone complications.

Post-typhoid septicemia is a rare complication following prolonged cases.

Sequelæ

Typhoid fever is often followed by post-typhoid neurasthenia, falling out of the hair, anemia and bacilluria.

When neurasthenia develops, the patient complains of exhaustion, sleeplessness, nervousness, rapid heart action and loss in weight for weeks or months. The condition gradually improves.

The hair may fall out to such an extent that the patient may become entirely bald.

Bacilluria is a condition in which typhoid bacilli are present in the urine for weeks or months after the illness.

Carriers: Carriers are patients whose stools contain typhoid bacilli even after they have completely recovered. They may therefore transmit the disease to others especially when engaged in food-handling occupations.

Treatment

Typhoid fever is usually treated by the following methods:

1. Preventive Treatment.
2. Quarantine or Isolation.
3. Diet.
4. Symptomatic Treatment.
5. Nursing Care.
6. Treatment of Complications.

Preventive Treatment: Typhoid fever may be prevented by proper sanitation, isolation of patients and carriers and inoculation with typhoid vaccine.

The water supply and the handling of such foods as milk, oysters and uncooked vegetables should be supervised. Typhoid patients should be isolated in the usual manner. Carriers should not be employed as waiters, cooks, milkmen or in any occupation in which food is handled.

Preventive Inoculation: The injection of typhoid vaccine containing dead typhoid bacilli will prevent typhoid fever. The vaccine is given in three doses at intervals of a week. The first dose contains 500 million typhoid bacilli and 375 million of Paratyphoid A and a similar quantity of Paratyphoid B bacilli. The second and third doses each contain a double quantity of the bacilli.

The injection is followed by a characteristic reaction, in about four to six hours or longer. It consists of redness and swelling at the site of injection, a feeling of illness, headache and chilly sensations, pains in the limbs, a rise in temperature and sometimes nausea and vomiting. Sometimes the reaction is quite severe and the temperature may reach 102° or 103° F. The symptoms usually disappear in twenty-four to forty-eight hours.

A method for immunizing the intestines against typhoid fever has recently been devised by Dr. Besredka of the Pasteur Institute in Paris. It consists of giving by mouth capsules containing several billion dead typhoid bacilli, and ox bile, at intervals of a week, for three weeks. The vaccine given in this manner makes the mucous membrane of the intestine immune to typhoid bacilli. If food containing the germs enters the intestines the disease will not develop.

Isolation: Typhoid fever patients should be isolated, but the isolation need not be as strict as in contagious diseases because the disease is transmitted only by direct contact with the patient

or his excretions. In hospitals, typhoid fever patients are kept in the same ward with other patients, but the bed is isolated by screens. The bed should be covered with mosquito netting to keep flies away. The patient should have separate marked dishes. All the dishes should be sterilized before being used again. The nurse in charge of a typhoid fever patient should not be permitted to handle other patients and should under no circumstances handle food for other patients.

Disinfection of Excretions: The patient's excretions should be disinfected by various antiseptic solutions. The following methods are advised by the New York City Board of Health:

The stools should be covered with a 5 per cent solution of chloride of lime and allowed to stand for half an hour. They are then poured into a specially designated toilet.

The urine should be mixed with an equal amount of a 5 per cent solution of chloride of lime, in a receptacle which should be covered. After standing for half an hour it should be poured into a specially designated toilet.

The bed linen should be placed in large specially marked cans and sprinkled with a 2½ per cent solution of carbolic acid. The linen is then taken to the laundry in the specially marked containers and is steamed before being washed. Lysol, carbolic acid, creolin, or other similar substances may be used instead of chloride of lime.

Diet: The diet is a very important part of the treatment of typhoid fever because the patient has a protracted wasting fever for weeks and because there are ulcers in the small intestines. It was formerly the custom to keep the patient on a liquid or milk diet to avoid irritating the ulcers in the small intestine. These diets, however, did not provide sufficient nourishment and lessened the patient's resistance. The modern tendency is to feed the patient adequately to maintain nutrition during the weeks of fever and thereby to increase his strength and resistance.

The diet usually ordered provides about 2500 to 4000 calories and contains about 70 grams of protein with an excessive amount of carbohydrates. The principal foods given are milk, eggs and gruels. The milk may be plain, peptonized, fermented milk, or junket. The eggs are given raw, as albumin water, eggnog, or soft boiled or in custard. The cereals and other foods commonly given are farina, rice, oatmeal, mashed potatoes, toast, noodles, pea soup, bean soup, and broths. To prevent tympanites, lactose is substituted for ordinary sugar. The following is a type of high calory diet used in typhoid fever:

HIGH CALORY TYPHOID FEVER DIET

Diet During First Two Weeks

Time	Food	Amount	Calories	Total Calories at Each Feeding
6 A.M.	Milk	3 ounces	60	
	Cream	1½ ounces	90	
			—	150
8 A.M.	Milk	8 ounces		160
10 A.M.	Custard	1 cup		250
12 NOON	Broth	8 ounces	20	
	Fruit Jelly	1 ounce	76	
			—	96
2 P.M.	Cream	2 ounces	120	
	Eggs	2	120	
	Milk	4 ounces	80	
			—	320
4 P.M.	Cocoa	1 teaspoon	50	
	Lactose	2 ounces	240	
	Cream	2 ounces	120	
	Milk	4 ounces	80	
	(Prepared as a drink, served cold.)		—	490
6 P.M.	Pea Soup	6 ounces		102
8 P.M.	Broth	8 ounces	20	
	Egg	1	60	
			—	80
10 P.M.	Custard	1 cup		250
12 P.M.	Milk	8 ounces	160	
	Cream	2 ounces	120	
			—	280
2 A.M.	Broth	8 ounces		20
4 A.M.	Farina	2 ounces	200	
	Cream	2 ounces	120	
			—	320
Extras	Water	20 ounces		0
				Total Calories 2,518

Diet During Subsequent Weeks

Time	Food	Amount	Calories	Total Calories at Each Feeding
6 A.M.	Broth	8 ounces	20	
	Egg	1	60	
			—	80
8 A.M.	Coddled Egg	2	120	
	Toast	2 pieces	160	
	Butter	1 cube	35	
	Oatmeal	2 ounces	200	
	Milk	12 ounces	240	
	Apple Sauce	4 ounces	120	
	Scraped Beef	1 ounce	50	
			—	925
10 A.M.	Milk	8 ounces		160
12 NOON	Mashed Potatoes	3 ounces	420	
	Cream	2 ounces	120	
	Bean Soup	8 ounces	160	
			—	700
2 P.M.	Iced Tea with Lemon			
	Lactose	2 ounces	240	
	Apple Sauce	2 ounces	60	
			—	300
4 P.M.	Graham Crackers	3	90	
	Fruit Jelly	2 ounces	152	
	Cream	2 ounces	120	
	Milk	4 ounces	80	
			—	442
6 P.M.	Milk	6 ounces	120	
	Cocoa	1 teaspoon	50	
	Cream	3 ounces	180	
	Toast	2 pieces	160	
	Butter	1 cube	35	
	Farina	2 ounces	200	
			—	745
8 P.M.	Gruel, Oatmeal	6 ounces	75	
	Cream	2 ounces	120	
	Butter	1 cube	35	
			—	230
2 A.M.	Egg	1	60	
	Cream	2 ounces	120	
	Milk	8 ounces	160	
			—	340
4 A.M.	Milk	8 ounces		160
Extras	Water	30 ounces		
				Total Calories 4,082

Foods Permitted and Their Caloric Values

Food	Amount	Calories
Milk	4 ounces (small glass)	80
Cream (20%)	1 ounce	60
Egg	1	60
Egg Albumen	1 ounce	30
Cocoa	1 dram (1 teaspoon)	50
Lactose	1 ounce	120
Custard	4 ounces (1 cup)	250
Junket	4 ounces (1 cup)	80
Apple Sauce	1 ounce	30
Ice Cream	1 ounce	57
Apple Jelly	1 ounce	76
Calfsfoot Jelly	1 ounce	27
Soda or Graham Cracker	1 cracker	30
Bread or Toast	1 slice	80
Whey	4 ounces	33.5
Farina and Oatmeal (Cooked 3 hours)	1 ounce	100
Boiled Rice	1 ounce	120
Oatmeal Gruel	4 ounces	50
Butter	1-inch cube	35
Mashed Potato	1 ounce	140
Noodles or Spaghetti	1 ounce	110
Broth (Beef, Chicken or Mutton)	8 ounces	20
Pea Soup	1 ounce	17
Bean Soup	1 ounce	20
Scraped Beef	1 ounce	50
Coffee	———	——

Dietary Difficulties: The diet is usually modified when tympanites, vomiting, diarrhea or other complications develop.

When tympanites occurs, the diet is usually modified in one or all of the following ways:

1. lactose is substituted for cane sugar.
2. the quantity of milk is diminished.
3. the quantity of carbohydrate food is limited.
4. the total amount of food is lessened.

When vomiting occurs the milk may be eliminated from the diet entirely or the quantity of food may be diminished.

When diarrhea develops, liquids, and barley or other gruels, or boiled milk, are substituted for the regular diet.

Diet During Convalescence: When the patient's temperature has remained normal for about a week, new foods such as cooked vegetables, a lamb chop, chicken, potatoes and other vegetables are gradually added, one food at a time. If the patient stands

these well, others may be given from time to time. If the addition of a new food causes a rise in temperature, the patient should go back to the original diet until the temperature is normal again.

Symptomatic Treatment: The treatment of typhoid fever consists principally of relieving the symptoms of the disease, because there is no effective specific remedy. The fever, delirium and prostration, which are the chief symptoms, are treated by various baths. The Brandt bath, cold packs or cold sponges are the baths usually ordered. The Brandt bath was formerly used extensively. It is given especially when the nervous symptoms are quite severe or when the temperature is above 103° F. It requires several people to give such a bath. The tub is placed at the side of the bed and filled with water of a temperature of about 80° or 85° F. As the patient gets accustomed to it the temperature of the water may be lowered gradually to 70°. The patient is placed in the tub with proper supports and rubber pillows under the head. He is kept in the bath for about fifteen or twenty minutes and the entire body except the abdomen is rubbed continually. Some patients get blue and shiver while in the tub. The patient's temperature is taken before being placed in the bath and again about three-quarters of an hour later. Whenever there are any complications, tub baths are discontinued. The object of the Brandt bath is to relieve the nervous symptoms, the delirium, and the profound depression and apathy.

The tub bath is too strenuous for many patients. A cold pack or a cold sponge given in bed is now more commonly used. The cold pack is given by wrapping the patient in a sheet soaked in cold water at a temperature of 60° to 65° F., for about fifteen minutes to half an hour. Sometimes a cold water spray is ordered instead of a cold pack.

When the temperature is excessive, coal-tar drugs such as pyramidon, phenacetin and similar substances are sometimes ordered.

Most physicians usually order colon irrigations to prevent tympanites.

The delirium is usually treated by baths, by applying ice bags to the head and sometimes by sedatives such as luminal, bromides, etc.

When diarrhea occurs the diet is modified and bismuth preparations or opium or morphine are ordered. Sometimes saline irrigations are given to remove putrefactive material.

For constipation mild nonirritating enemas are given.

Nursing Care: Good nursing is one of the most effective remedies in typhoid fever. The patient should be made as comfortable as possible by all the usual nursing procedures. The patient's position should be changed frequently, and the prolonged or severe cases should be kept on a water bed to prevent bed sores.

The nurse should be on the lookout constantly for any changes in symptoms. She should know the possible complications that may develop and report any change in the patient's condition to the physician at once, because early recognition of the most important complications such as hemorrhage or perforation may save the patient's life.

Treatment of Complications: Tympanites is usually treated by a change in diet. The quantities of food are diminished, milk is often eliminated and lactose is substituted for cane sugar. Hot applications or turpentine stupes are usually applied to the abdomen. Colon irrigations are commonly given both for prevention or treatment. Turpentine or asafetida enemas or cathartic enemas are sometimes ordered. In severe cases pituitrin or eserine are ordered hypodermically.

When hemorrhage occurs the diet is changed at once. The patient is given only small quantities of liquids, or feeding may be stopped entirely. An ice bag is usually applied on the abdomen and ice pills are given by mouth. Bismuth preparations or tannic acid preparations, such as tannigen, tannalbin, etc., are given to coat the bleeding ulcers, and morphine or opium is given to check perisfalsis. If the pulse becomes rapid or weak or the patient develops collapse, stimulants such as camphor, digitalis, adrenalin, etc., are ordered. If the hemorrhage has been profuse, a transfusion is performed. If a transfusion cannot be done, horse serum may be injected intramuscularly to help blood clotting or an intravenous infusion of saline solution is given.

The treatment of a perforation is early operation. The sooner the patient is operated upon, the better are the chances for recovery. The nurse can help the physician make an early diagnosis by notifying him at once whenever any symptoms occur that suggest a perforation.

The treatment of a relapse is the same as the treatment of typhoid fever itself. If the patient is on a more liberal diet when the relapse occurs, it is changed to the usual typhoid diet.

Phlebitis is treated by complete rest in bed. The leg or the

affected part of the body should be moved as little as possible. An ice bag is kept constantly over the affected area until the tenderness and pain subside. The swelling of the leg, however, may persist for some time.

When cholecystitis develops the patient is put on a very light diet consisting principally of warm fluids. A hot-water bag is applied to the region of the gall bladder and morphine or atropine is given by mouth.

Bronchopneumonia and acute nephritis in typhoid fever are treated in the usual manner.

Cardiac complications are treated by heart stimulants, such as digitalis, adrenalin, camphor, etc.

Bed sores may be prevented by keeping the skin scrupulously clean and by the early use of a water bed or pneumatic rings. The patient's position should be changed frequently, the skin should be frequently rubbed with alcohol, and pillows should be placed under the parts of the body subject to pressure. When bed sores develop, they are treated by surgical methods.

Cystitis is treated by urotropin together with bicarbonate of soda or acid sodium phosphate, or by caprokol, to disinfect the urine. If the cystitis is severe, bladder irrigations with various antiseptic solutions such as acriflavine or silver nitrate are ordered.

Typhoid spine is treated by vaccines, by sedatives, and in severe cases by a plaster cast to immobilize the spine.

Treatment of Sequellæ: The falling out of the hair is usually treated by the use of various lotions, hair tonics, etc.

Post-typhoid neurasthenia is treated by rest, sedatives and overfeeding.

Carriers are treated by means of autogenous typhoid vaccines, that is, vaccines made from their own typhoid bacilli. Urotropin with bicarbonate of soda or acid sodium phosphate or intestinal disinfectants are also given. Sometimes the gall bladder is removed because the typhoid bacilli are usually present in the gall bladder. Carriers should not be allowed to engage in occupations which require handling foods.

PARATYPHOID FEVER

Paratyphoid fever is an acute infectious disease caused by the Paratyphoid bacillus, a germ closely related to the typhoid bacillus. There are two types of this bacillus, Paratyphoid A and Paratyphoid B. Paratyphoid A infection is more common in the

United States, while the Paratyphoid B infection is more common in Europe.

Cause: The disease is caused in the same manner as typhoid fever, by contaminated food or milk. It is frequently transmitted by carriers. Paratyphoid B infections may result from meat poisoning.

Symptoms: The incubation period is about ten days and the symptoms are like those of typhoid fever, but they sometimes develop suddenly. The disease runs a shorter course, the symptoms are milder, and there is less tendency to the development of complications, especially complications in the intestinal tract.

The diagnosis is made when paratyphoid bacilli are found in the blood or when a Widal test is positive for paratyphoid bacilli.

The disease is treated like typhoid fever.

DYSENTERY

Dysentery is a disease characterized by profuse diarrhea. It is usually caused by bacteria or other irritants such as decomposed food, mercury or other chemical poisons. The disease is often called colitis, because the large intestine or colon is usually affected.

BACILLARY DYSENTERY

Bacillary dysentery is a form of dysentery caused by the Shiga or Flexner bacillus.

Cause: The disease occurs among children, especially in the summer time. It is more prevalent in tropical countries. It is usually transmitted by contaminated drinking water or by carriers whose stools contain the specific germs.

Pathology: The disease principally affects the large intestine, which becomes severely inflamed. In severe cases there are small ulcers in the intestine.

Symptoms

The onset is sudden, with severe abdominal cramps, diarrhea, and a rise in temperature. The stools are very frequent, and they contain mucus and blood. The patient often complains of severe rectal tenesmus, a constant desire to move the bowels, even when they are empty. There is usually a rise in temperature, and the patient feels quite ill. The continued diarrhea produces symptoms of collapse, weakness, rapid pulse, etc. The disease usually lasts about ten days.

Treatment

The disease is treated by preventive measures, a suitable diet and remedies to relieve the diarrhea and the collapse.

Preventive Treatment: Dysentery may be prevented by proper supervision of the water supply and proper quarantine of carriers, patients and convalescents. It is preferable to boil drinking water whenever there is any uncertainty about its source.

General Care: The patient should be put to bed and isolated in the usual manner. All the excreta should be thoroughly disinfected. The diet usually consists, in the beginning, of broth, albumin water, plenty of liquid, barley and rice. When the diarrhea improves, milk and other articles of food are added gradually. The diarrhea is treated by various astringents such as bismuth, tannic acid, opium preparations, etc. High colon irrigations are often ordered to keep the bowels free of infectious material. The collapse is treated by large quantities of fluid, whisky and sometimes by cardiac stimulants.

CHAPTER VII

SPECIFIC LOCAL INFECTIONS

Specific local infections are diseases characterized by an infection in some organ or tissue which produces both local and general symptoms.

ACUTE FOLLICULAR TONSILLITIS

Acute follicular tonsillitis is an acute infection of the tonsils. A severe form of the disease is sometimes called septic sore throat.

Cause: The disease is caused by various germs, especially the streptococcus, staphylococcus, influenza bacillus and others.

It is more common in young people and frequently occurs in epidemics, in boarding schools, army camps or wherever a large number of people live together. It is especially prevalent in the spring and fall. Enlarged or infected tonsils, chronic sinus disease, or exposure to wet and cold are predisposing causes.

Symptoms

The symptoms are a characteristic inflammation of the throat and the general symptoms of fever. The disease begins suddenly with a feeling of illness, headache, chills or chilly sensations, pain in the throat, especially on swallowing, and a sudden rise in temperature which may be slight or reach 103° or 104° F.

Appearance of the Throat: The throat is intensely inflamed. The tonsils are red and swollen and the follicles contain small plugs of yellow pus. The glands in the side of the neck are also swollen and tender. The appearance of the tonsils differs from that in diphtheria. The follicles do not spread rapidly and when they are removed they do not leave a bleeding spot.

Sometimes the tonsils may become red, acutely inflamed and swollen without developing follicles of pus. In some cases the adenoids are also swollen and inflamed and the patient has a raw sensation and a purulent discharge in the back of the throat. A culture of the secretions in the throat is usually taken to differ-

entiate the disease from diphtheria which occasionally resembles tonsillitis. The physician does not usually base his diagnosis entirely on the appearance of the throat. The temperature persists for a few days and then it gradually subsides. The follicles now disappear and the patient feels better again.

Complications: The most common complications of acute follicular tonsillitis are rheumatic fever, peritonsillar abscess, otitis media (ear infection), subacute nephritis and septicemia.

Treatment

The treatment consists of prevention, local treatment, and the treatment of the fever.

Preventive Treatment: The occurrence of repeated attacks of acute tonsillitis may be prevented by removing the tonsils when they are enlarged and infected. Patients subject to frequent attacks of tonsillitis should avoid exposure to wet and cold.

Local Treatment: The tonsils are often painted with solutions of argyrol, lunosol, silver nitrate, or other similar substances. Some physicians prefer gargles of antiseptic solutions. In severe cases the throat is often irrigated with a normal salt solution or antiseptic solutions by means of a special glass irrigating tip. The pain in the throat is sometimes relieved by keeping small pieces of ice in the throat.

An ice bag or cold compresses are applied to the neck to relieve the inflammation of the tonsils and the swollen glands in the neck.

The fever is treated by coal-tar remedies such as phenacetin, pyramidon or salicylates such as salol, aspirin, quinine, etc.

PERITONSILLAR ABSCESS OR SUPPURATIVE TONSILLITIS

Peritonsillar abscess, suppurative tonsilitis, or quinsy sore throat, is a disease characterized by the formation of an abscess around the tonsils.

Cause: The disease may occur as a complication of follicular tonsilitis or it may begin as an acute inflammation around the tonsil. As a rule, only one tonsil is affected and an abscess gradually develops between the tonsil and the tissues of the neck.

Symptoms: The symptoms begin with a sudden rise in temperature, reaching 103° or 104° F., and a rapid pulse. The patient complains of difficulty in swallowing, pain in one side of the

neck, and the glands in the neck become swollen and tender. Gradually one tonsil bulges toward the middle line and finally an abscess develops around it. The abscess sometimes ruptures spontaneously. There is usually a profuse secretion of mucus and saliva in the mouth.

Treatment: The abscess is usually incised to drain the pus. To prevent recurrent attacks, the tonsils are usually removed as soon after the attack as is feasible.

ACUTE RHEUMATIC FEVER

Acute rheumatic fever is an acute infectious disease characterized by painful swelling of the joints and a tendency to develop heart complications. The disease is also called acute articular rheumatism and acute inflammatory rheumatism. It is frequently associated with chorea or St. Vitus' dance.

Cause: The specific cause of the disease is not definitely known but it is believed to be due to certain forms of streptococci which probably enter the body through the tonsils.

The disease occurs especially in young people between the ages of 15 to 25, and also in children. It is more prevalent in the early spring and winter. Frequent attacks of tonsillitis may be followed by acute articular rheumatism. The disease is especially common among chauffeurs, drivers, longshoremen and others whose occupation exposes them to wet and inclement weather.

Pathology: The disease process consists principally of an acute inflammation of the serous membrane of the joints, with an accumulation of fluid within the joints. There is a tendency to develop a similar acute inflammation of the membranes and valves of the heart.

Symptoms

The symptoms begin suddenly and consist of fever and painful swelling of the joints. The temperature rises rapidly and may reach 102° or 103° F., and the pulse is rapid. The joints become painful, swollen and red, and sometimes fill up with fluid. One joint after another becomes inflamed in this manner. As a rule, the large joints are principally affected; the knees, the elbows, the hips, the wrists, or shoulders. The patient is unable to move the limbs because of the intense pain and swelling.

A characteristic feature of the disease is profuse perspiration and the rapid development of anemia.

The disease may run a short course or may last for weeks and recurrences are frequent.

Complications: The most common and serious complications are acute endocarditis, acute pericarditis, pleurisy and purpura. Acute endocarditis is an inflammation of the lining membrane and the valves of the heart. When this complication occurs in the course of the disease, the temperature persists or begins to rise again. The patient has pain over the heart area, a rapid pulse and the physician may hear a characteristic murmur over the heart.

Acute pericarditis is an inflammation of the outer covering of the heart. This complication frequently occurs together with pleurisy with effusion (an accumulation of fluid in the chest) and sometimes with pneumonia.

Purpura is a rash characterized by small hemorrhagic spots in the skin and sometimes occurs in severe cases.

Anemia is a usual sequel in prolonged cases of acute rheumatic fever.

Chorea or St. Vitus's dance often precedes or follows acute rheumatic fever.

Chronic rheumatism is a rare complication.

Treatment

The treatment may be divided into preventive measures, specific remedies, local treatment and nursing care.

Prevention: Acute rheumatic fever may be prevented by avoiding exposure to wet and cold, the removal of infected tonsils or teeth, and treating infected sinuses.

Specific Treatment: Salicylates given in large doses are the specific remedies for the disease. Sodium salicylate, salol or aspirin are the preparations usually ordered in large doses. Sodium salicylate is given in very large doses, about 60 to 100 grains a day. It is sometimes given by rectum in a suppository, or in starch or olive oil in very large doses, 150 to 200 grains. In severe cases the salicylates are given intravenously. When other methods of treatment are not successful, vaccines made from the bacteria in the tonsils are given by injection. Recently a serum made from a type of streptococcus which is believed to be the cause has been used.

Local Treatment: The affected joints should be kept in a comfortable position to avoid pain produced by motion. Some physicians order various local applications to the joints such as

oil of wintergreen, lead and opium wash, Epsom salt, Burow's solution, guiacol, and similar remedies.

Nursing Care: The patient should be put to bed and the joints made as comfortable as possible. He should wear flannel underclothing because of the tendency to profuse perspiration. The diet usually ordered consists principally of fluids, milk, and cereals; eggs, vegetables and other articles are then gradually added. Alkaline water is often given in large quantities.

Treatment of Complications: When endocarditis develops the patient is kept in bed, salicylates are continued and an ice bag is applied to the heart region. The patient is not permitted to get up until the heart symptoms have disappeared.

ERYSIPELAS

Erysipelas is an acute infectious disease characterized by a severe acute inflammation of the skin, which is caused by a type of streptococcus, the Streptococcus erysipelas.

Cause: The causes of erysipelas may be divided into specific and predisposing.

The specific cause of a type of streptococcus which enters the skin through abrasions or an operative wound.

The predisposing causes are old age, arteriosclerosis, nephritis, diabetes, chronic alcoholism and other chronic diseases.

The disease frequently occurs after labor or in newly born infants or following an injury such as a fracture, or as a complication after any surgical operation.

Pathology: The disease is a severe, acute inflammation of the skin and the neighboring lymph nodes. In severe cases septicemia, with its usual complications, may develop.

Symptoms

The incubation period is from three to seven days. The symptoms are a characteristic, acutely inflamed skin, and fever; which may be followed by septicemia.

The disease begins suddenly, with a chill, high fever, rapid pulse rate, and all the symptoms of fever. The skin becomes acutely inflamed, fiery red, swollen and tender. There are numerous red lines extending from this area, which are the inflamed lymph vessels. The disease usually affects the face and legs. When it follows a surgical operation or an injury, the skin around the site of injury or wound is first affected.

The lymph nodes which drain the inflamed part of the skin are usually swollen and tender. The area of inflammation spreads rapidly, often extending over large areas of skin. In old people parts of the skin frequently become gangrenous. The temperature lasts for three or four days and gradually subsides unless complications develop.

Some forms of erysipelas have a tendency to recur, especially erysipelas of the face.

Complications: The principal complications are phlebitis, arthritis, abscesses, septicemia, pneumonia, and nephritis. They occur especially in old people or those with predisposing causes.

Phlebitis is an inflammation of a vein in the neighborhood of the affected skin. The infected vein becomes painful, tender and swollen.

Arthritis is an acute inflammation of a joint which develops when the erysipelas occurs in a region of the skin near the joint.

Abscesses sometimes develop under the affected skin.

Septicemia is the most serious complication and results when the streptococci enter the blood stream. The patient runs a severe, septic, intermittent temperature with chills and fever, which may be followed by the usual complications of this condition.

Treatment

The treatment consists of proper isolation, local treatment, specific treatment, and measures to reduce the fever.

Isolation: A patient with erysipelas is usually isolated, and separate linens, towels, dressings and instruments are used. It is not necessary to use separate dishes. The nurse should wear rubber gloves whenever she handles the patient, especially the area of erysipelas, and she should take all precautions to prevent spreading the infection.

Local Treatment: Various local remedies are usually applied to the inflamed area of skin. The substances used are Burow's solution, ichthyol, acriflavine, mercurochrome, saturated solutions of Epsom salts, etc. The skin around the border of the erysipelas is sometimes painted with collodion to contract the lymphatics and prevent spreading the infection. If the inflammation is very severe, the inflamed skin is sometimes incised.

Specific Treatment: This consists of injecting specific vaccines and serums to overcome the infection. Erysipelas antitoxin is a new antitoxin made from the streptococcus of erysipelas which seems to be an effective remedy.

Treatment of Fever: The fever is treated in the usual manner,

by sponge baths, by a limited diet, plenty of water, and coal-tar remedies.

GONORRHEA

Gonorrhea is an acute infectious disease caused by the gonococcus. The disease affects principally the mucous membranes, especially in the urethra, cervix and the conjunctiva of the eye.

Cause: The disease is caused by the gonococcus, a small, round germ which is usually transmitted by genital infection. It is sometimes transmitted by the sheets, dressings, or secretions of gonorrheal patients.

Pathology: The disease process consists of a severe infection with the formation of a characteristic pus and destruction of the mucous membrane.

Clinical Forms

Gonorrhea occurs in the following three forms:

1. Acute Gonorrhea.
2. Gonorrhea in Children.
3. Chronic Gonorrhea.

Acute Gonorrhea

Acute gonorrhea affects principally the urethra and cervix. The symptoms develop about a week after exposure to the infection. The patient develops frequent and painful urination and a thick purulent discharge from the urethra. The gonococci may be found in the pus when it is examined under the microscope. In female patients there is also a purulent discharge from the cervix.

Complications: The complications of acute gonorrhea result from the extension of the infection into neighboring organs or from careless handling of the discharges. In the female the infection extends up into the tubes, causing a salpingitis or pyosalpinx, an inflammation or abscess within the tubes. Sometimes the inflammation involves all the neighboring structures around the uterus, and a pelvic abscess forms. The end result of gonorrheal infection in the tubes is extensive inflammation with destructive changes and adhesions of the tubes or ovaries. This condition may cause sterility.

In males, gonorrhea may extend up into the prostate, epididymis and neighboring genital structures.

A severe inflammation of the eyes may result when gonorrheal

pus gets into the eye from handling the discharges carelessly. It may produce permanent blindness.

Gonorrhea in Children

Gonorrheal infection in children occurs in two forms: Gonorrhea in the newborn and gonorrheal vaginitis.

Gonorrhea in the Newborn: This is a severe infection of the conjunctiva of the eye which may destroy the cornea and cause blindness. It usually results when the mother has a gonorrheal infection and some of the pus gets into the eye of the baby during childbirth.

A few drops of argyrol or a silver nitrate solution is always dropped into the conjunctiva of the eye of every newborn child to prevent gonorrheal infection.

Gonorrheal Vaginitis: This is a form of gonorrhea which occurs in little girls. It is characterized by a discharge of pus from the vagina. It is readily transmitted by bed linen and often spreads rapidly through an entire ward of a hospital.

Chronic Gonorrhea

Chronic gonorrhea occurs in two forms: gonorrheal arthritis and chronic gonorrhea of the genital organs.

Gonorrheal Arthritis: This is a gonorrheal infection of the joints which often occurs in chronic gonorrhea. It is characterized by painful swelling of one joint, usually the knee, the spine or another large joint. There are usually destructive changes or adhesions within the joint which limit the movements. The disease sometimes runs a long chronic course which terminates in a permanent stiff joint.

Chronic Gonorrhea of the Genitals: This is a chronic infection of the genital organs which produces a chronic discharge from the urethra. In female patients it often produces leucorrhea.

Uncommon Forms of Gonorrhea

Gonorrheal peritonitis is a form of localized peritonitis which usually follows a gonorrheal infection in the tubes and ovaries. The process sometimes extends into the pelvis, forming a large abscess. The infection is not a severe one but it may last for a long time.

Gonorrheal septicemia is a very rare complication of gonorrhea which may be mild or prolonged. The symptoms consist of fever lasting for weeks or even longer. Sometimes a cardiac

complication such as an ulcerative endocarditis or a pericarditis develops.

Tests for Gonorrhea

A positive diagnosis of gonorrhea is usually made by examining a smear of the pus on a glass slide under the microscope. The gonococci can readily be seen within the leucocytes of the pus.

Method of Obtaining a Smear: The nurse frequently has to make smears of urethral pus in female patients. A smear is taken in the following manner: After separating the labia of the vagina, a few drops of pus are taken from the urethra with an applicator. The pus is spread on a glass slide which should be properly labeled and sent to the laboratory.

Gonococcus Fixation Test: This is an indirect blood test similar to the Wassermann test, which is used for diagnosing gonorrhea.

Treatment

The treatment of gonorrhea consists of preventive measures, local treatment, and the treatment of complications.

Preventive Treatment: The prevention of gonorrhea is largely a public health problem. The education of the public in the dangers and consequences of gonorrheal infection is the principal method by which the prevalence of the disease can be lessened. In all large cities the cases of gonorrhea must be reported to the Board of Health. The instruction in sex hygiene and methods of prevention had greatly diminished the frequency of the disease in the army during the World War.

Local Treatment: Silver salts are especially effective local remedies for gonorrhea. The local treatment consists of injecting solutions of silver nitrate, argyrol, protargol, lunosol, potassium permanganate, and similar substances into the urethra or cervix. During the acute stage the patient is sometimes confined to bed.

Gonorrhea in the newborn is usually prevented by dropping a few drops of silver nitrate salts, argyrol or other silver preparations into the eyes of every child at birth. When it develops it is treated by solutions of silver salts.

Nursing Care: When a patient with acute gonorrhea is confined to bed it is essential to prevent spreading the infection; this is especially important in cases of Gonorrheal Vaginitis in children, which spreads very rapidly. The nurse should wear gloves when giving douches or other treatments to gonorrheal patients.

She should handle the bed linen very carefully because they may be soiled with gonorrheal discharges. The patient should be instructed to wash the hands after handling any dressings, and not to touch the eyes. Gonorrheal eye infections may result from careless handling of dressings and may cause permanent blindness.

Treatment of Complications: Gonorrheal infections of the tubes and ovaries are treated by rest in bed, an ice bag over the abdomen, douches and sometimes by baking. Frequently, however, many of these patients have to be operated upon.

Gonorrheal arthritis is treated like any other form of chronic arthritis, by baking, salicylates, atophan and gonococcus vaccine. Protein shock treatment is frequently used. Sterile milk is injected intramuscularly or typhoid vaccine is given intravenously.

CHAPTER VIII

SPECIFIC ACUTE INFECTIONS OF THE LUNGS

PNEUMONIA

Pneumonia is an acute inflammation of the lungs or part of a lung associated with a severe toxemia.

Classification

Pneumonia may be classified in several ways as follows:

1. According to the extent of the involved area in the lung:
   (a) Acute lobar pneumonia.
   (b) Acute bronchopneumonia.

Acute lobar pneumonia is a form of pneumonia in which the inflammatory process is limited to one or several lobes of the lung.

Acute bronchopneumonia or lobular pneumonia is a form of pneumonia in which the inflammatory process consists of various irregular shaped areas usually situated around some of the terminal bronchioles.

2. According to the bacteria which cause the disease:
   (a) Pneumococcus pneumonia.
   (b) Streptococcus pneumonia.
   (c) Influenza bacillus pneumonia.
   (d) Tuberculous pneumonia.

3. According to the predisposing cause:
   (a) Ether pneumonia or post-operative pneumonia.
   (b) Hypostatic pneumonia.
   (c) Terminal pneumonia.

Ether or post-operative pneumonia is a form of pneumonia which follows the administration of ether as an anesthetic, or an operation.

Hypostatic pneumonia is a form of pneumonia which occurs in old people, especially when they have to remain in bed with a protracted illness.

Terminal pneumonia is a form of pneumonia which is the cause of death in many chronic diseases such as chronic heart disease, chronic Bright's disease, etc.

Ether pneumonia, hypostatic pneumonia, or terminal pneumonia are usually forms of bronchopneumonia.

4. According to special characteristics of the disease:

(a) Pleuro pneumonia.
(b) Central pneumonia.
(c) Migrating pneumonia.
(d) Double pneumonia.

Pleuro pneumonia is a form of pneumonia which is associated with pleurisy. There is usually an accumulation of fluid within the pleural cavity.

Central pneumonia is a form of pneumonia in which the inflammatory area is situated deep in the center of the lung and on that account may not be recognized until the process extends into portions of the lungs nearer the surface.

Migrating pneumonia is a form of lobar pneumonia which extends from one lobe to another, either before the inflammation in one lobe has subsided, or while the process is still going on.

Double pneumonia is a form of lobar pneumonia in which both lungs are involved simultaneously.

Cause

Pneumonia is caused by various bacteria especially when the patient has certain predisposing factors.

Specific Cause: Most cases of lobar pneumonia are caused by the pneumococcus, of which there are four types. The streptococcus and the influenza bacillus usually cause bronchopneumonia, but they also occasionally cause lobar pneumonia.

Predisposing Causes: The predisposing causes of pneumonia are exposure to wet and cold, a previous attack, exhaustion, poor physical condition, cardiac or renal disease, old age, the administration of an anesthetic, and chronic alcoholism. The disease is more prevalent in the spring.

Pathology: The structural changes in pneumonia consist, first, of congestion of the lung capillaries in the affected area, which is known as the **stage of congestion.** This is followed by the passage of serum, fibrin, leucocytes, and red blood cells into the air sacs. This is known as the **stage of consolidation** because the involved lung area has a solid appearance instead of a spongy

one. In lobar pneumonia an entire lobe or several lobes of a lung are consolidated. In bronchopneumonia areas of consolidation develop around the terminal bronchial tubes.

As the pneumonia subsides, the contents of the air sacs are digested and become liquefied. This is known as **the stage of resolution.**

ACUTE LOBAR PNEUMONIA

Cause: Acute lobar pneumonia is usually caused by the pneumococcus, of which there are four types. The different types of germs are recognized by special bacteriological examination of the sputum.

Symptoms

The disease begins suddenly with a sharp pain in the chest, a chill and a sudden rise in temperature to 103° F., or more, with a rapid pulse, in proportion to the temperature, and all the symptoms of fever. This is accompanied by a cough and unusually rapid respiration. At first the cough is dry, but within twenty-four hours it is accompanied by expectoration of a thick, tenacious mucus which is usually of a rusty color and sometimes bloody.

The patient looks quite sick; the respiration is rapid, sometimes associated with a grunt on expiration, and the nostrils dilate with each inspiration. Sometimes one cheek is flushed, and in severe cases the face is purple or blue and cyanotic. There may be herpes, that is, fever blisters, on the lips.

The severity of the symptoms does not usually indicate the extent of the pneumonia, but rather the toxicity of the causative germ.

Signs Obtained by the Physician: During the first twenty-four hours, the physician is sometimes unable to determine the presence of pneumonia. On the following day or later, however, characteristic signs are produced over the involved lobe of the lung indicating that the spongy structure of the lung has become solid. These signs are "dullness" and "bronchial breathing." Dullness is a low-pitched sound produced when the chest is tapped. Bronchial breathing is a characteristic sound which the physician hears by listening over the chest with a stethoscope, whenever the lung or a portion of a lung becomes solid. In doubtful cases the lungs are sometimes examined with the X-ray. The affected part of the lung shows certain characteristic

shadows in the X-ray pictures. As a rule, only one lobe is involved, usually a lower lobe. Occasionally, however, several lobes of a lung are involved at once. Sometimes one lobe after another becomes affected, a condition known as migrating pneumonia.

Laboratory Signs: The sputum is usually examined to determine which type of pneumococcus is the cause of the disease. This is known as "typing the sputum." When the blood is examined the number of leucocytes and the polynuclear cells in the blood are increased; and in some cases the causative germs are found in the blood.

Crisis: The symptoms persist for a week or ten days or less. The temperature remains high, the respiration is rapid, the face is cyanotic, and the patient is uncomfortable and apathetic. At about the seventh to the tenth day, however, the patient's condition suddenly changes. The temperature drops to normal or nearly normal, the respiration becomes slower, the pulse rate becomes slower and stronger, and within a day or two the patient is apparently normal again. This sudden change in the symptoms is known as the crisis.

Resolution: When the physician examines the chest at this time the signs of consolidation are gone and he now hears numerous characteristic sounds called "râles." These signs indicate that the inflammatory process in the lungs is subsiding. This is known as the stage of resolution.

Pneumonia is a self-limited disease. The patient overcomes it by forming antibodies against the pneumococci. When the antibodies are developed in sufficient quantity the infection subsides and the patient gets a crisis. This usually takes about a week or ten days. If the patient is unable to develop sufficient antibodies, the temperature persists, all the symptoms get steadily worse and death results.

Complications

The most common complications of lobar pneumonia are the following:

1. Tympanites.
2. Cardiac complications.
3. Pleurisy.
4. Empyema.
5. Unresolved pneumonia.
6. Lung abscess.

7. Gangrene of the lung.
8. Complications in the nervous system.
9. Nephritis.

Tympanites: This is the most common complication in pneumonia. The abdomen gradually becomes distended, the patient is unable to pass gas, and the difficulty in breathing is greatly increased.

Cardiac Complications: These are the most serious complications in pneumonia. The most common form of heart complication is a progressive weakening of heart action, as a result of the severe toxemia. It is apt to occur especially at the time of the crisis. The pulse becomes rapid, weak and irregular. Occasionally sudden heart weakness with edema of the lungs develops and may be fatal. An acute myocarditis (an inflammation of the heart muscle) may occur in the course of the illness, and leave permanent changes in the heart. Acute pericarditis (an inflammation of the coverings of the heart) either dry or with the accumulation of serous fluid, is a serious complication of the disease and may last for some time.

Pleurisy: This may occur in two forms: dry pleurisy and pleurisy with effusion. Dry pleurisy consists of a deposit of fibrin on the surface of the lungs. Pleurisy with effusion is an accumulation of serous fluid in the chest cavity between the lung and the chest wall. This may keep up the temperature after the crisis. It sometimes develops after the temperature has subsided.

Empyema: This is an accumulation of pus in the chest cavity. It is a complication which occurs especially in children. The pus usually fills the entire chest cavity. A sacculated empyema is a form of empyema in which the pus is localized in one area. An interlobar empyema is an accumulation of pus between two lobes of a lung.

The empyema usually occurs after the temperature has already subsided. When it develops the temperature begins to rise again, the pulse and respiration become rapid, the patient has shortness of breath, and the number of leucocytes in the blood are increased.

Unresolved Pneumonia: This is a condition in which the disease process in the lungs does not clear up in the usual manner but takes place very gradually. The cough and expectoration, and sometimes the fever, persist for a long time.

Lung Abscess: Lung abscess is a rare complication of pneu-

monia which may develop in debilitated or rundown patients. The severe infection causes extensive destructive changes in the lung, with the formation of one or several abscess cavities. The symptoms are persistent temperature and the expectoration of large quantities of pus.

Gangrene of the Lung: Gangrene of the lung is a condition in which certain areas of the lung become gangrenous and destroyed by severe infections. It is a rare complication and may occur in debilitated or run-down individuals.

Complications of Nervous System: Delirium is a frequent complication, especially in those who habitually use alcoholic drinks. **Meningismus** is an irritation of the brain which develops in the course of pneumonia as the result of a severe infection. The patient becomes delirious, may have convulsions, rigidity of the neck, and the usual signs of meningitis.

Meningitis, an inflammation of the meninges or covering of the brain, sometimes occurs as a complication. It is characterized by rigidity of the neck, delirium, convulsions, and the usual signs of meningitis. The fluid from the spinal canal is usually withdrawn and may contain pus.

BRONCHOPNEUMONIA

Bronchopneumonia is a form of pneumonia in which the disease process occurs in the lung as irregular shaped areas, usually around the terminal bronchi. At first the affected parts of the lung are small, but as the inflammation extends, an entire lobe may become involved.

Cause: The disease is caused by various bacteria: the pneumococcus, the streptococcus, the influenza bacillus and others. This form of pneumonia often complicates grippe. It may also follow the administration of an anesthetic.

Symptoms

Bronchopneumonia usually begins gradually. The patient may have an acute bronchitis or grippe. The temperature steadily rises, the cough and expectoration increase, the respiration and pulse rate become more rapid, and the sputum becomes rusty or bloody. The patient is not so toxic as in lobar pneumonia and has more symptoms referable to the lungs, such as cough and profuse purulent expectoration. The temperature usually subsides by lysis, but occasionally a crisis may occur, as in lobar pneumonia.

Complications: The complications of bronchopneumonia are the same as those of lobar pneumonia, with the exception that the lung complications are more prevalent; such as empyema, lung abscess, gangrene of the lung, etc.

Treatment of Pneumonia

Pneumonia is usually treated by the following methods:

1. Preventive Treatment.
2. Specific Treatment.
3. Nursing Care.
4. Local Treatment.
5. Medicinal Treatment.
6. Symptomatic Treatment.

Preventive Treatment: The prevention of pneumonia consists principally in avoiding exposure to wet and cold, especially when one has had previous attacks. A patient with grippe or acute bronchitis should rest in bed, even when the attack is slight, to prevent the disease from extending into the lungs. If possible, old people who are subject to bronchitis should spend their winters in warm Southern climates. When it is necessary to give an anesthetic to old people or those suffering from chronic pulmonary disease, ether should not be used.

Specific Treatment: Pneumonia is now treated by various specific serums to destroy the germs or overcome the infection. The serum is usually given only after the type of pneumococcus causing the disease has been determined, because it is effective only for the type of germ for which it is made. For example, a pneumonia caused by Type 1 pneumococcus can only be treated by a serum made from Type 1. A pneumonia caused by Type 2 can only be treated by Type 2 serum, etc. The type of germ is determined by obtaining a specimen of sputum and testing it on mice or by other methods.

The most common serums used are antipneumococcus serum, Huntoon antibody serum, leucocyte extract and similar preparations. The best results are obtained when the serum treatment is given in the first few days of the illness. Antipneumococcus serum was introduced by the Rockefeller Institute of New York and is believed to be effective for pneumonia caused by Type 1 and Type 2 pneumococcus. It is given intravenously in 50 c.c. doses. It is sometimes followed by a severe reaction consisting of a chill and high temperature.

Huntoon antibody serum is really not a serum but a solution

containing antibodies for the pneumococcus germs. It comes in two forms: (1) a polyvalent serum, which contains antibodies for all forms of pneumococcus, (2) a serum made only for each type of pneumococcus. It is given either intravenously or intramuscularly, in doses of 50 c.c. It is occasionally followed by a severe reaction consisting of a chill and a rise in temperature.

If a serum is effective there is a prompt drop in temperature, the respiration and pulse rate are lessened, the cyanosis clears up, and the signs in the lung gradually disappear. All the symptoms subside promptly and the patient feels better.

Leucocyte extract is a substance made by injecting aleuronat, a kind of flour, into the chest of a rabbit. A serum is then obtained which contains large quantities of leucocytes. It is sometimes injected in pneumonia patients to increase their resistance to the infection.

Nursing Care: The patient is kept in bed and is more comfortable when resting on the side of the affected lung, because breathing is painful. Some physicians prefer plenty of air in the room but without draughts, while others are more conservative and like to have the room warm with a moderate circulation of air. The fresh air treatment was formerly very much in vogue. The windows were kept wide open, and some physicians would even put the patients out on the roof or on an open porch.

When the temperature is excessive, sponge baths are usually ordered. The mouth should be thoroughly cleaned at frequent intervals, because there is usually an accumulation of mucus and tenacious sputum which is very uncomfortable.

The nurse should watch the patient carefully and should note especially the character and rate of the pulse and respiration, the presence of cyanosis, and distention of the abdomen.

Local Treatment: Some physicians order local applications to the chest. In the beginning of the disease a mustard plaster or paste is applied to the chest, or the chest is rubbed with capsicum preparations. During the course of the illness many physicians apply a Priesnitz application, which consists of a piece of flannel surrounded by oiled silk. Diathermy, a method of applying deep internal heat by a special electrical apparatus, is sometimes used.

Medicinal Treatment: The remedies usually ordered are given either to prevent cardiac complications or to overcome the infection or to relieve various symptoms. Digitalis is ordered by most physicians to prevent cardiac complications. Some physicians begin the use of digitalis at the onset of the disease and

continue it until the crisis is over, while others only give it around the time of the crisis. When the heart action becomes weak, other heart stimulants, such as caffein, cardiozol, strychnine, adrenalin, etc., are given in addition to digitalis.

There are several remedies which are given in pneumonia to overcome the infection. Quinine or ethyl hydrocuprein, optochin base or numoquin, substances derived from quinine, are used more or less as specifics because they increase the antiseptic properties of the serum. They are given by mouth or by injection into the muscles or veins, in doses varying with the weight of the patient. Optochin frequently produces a number of poisonous symptoms such as disturbances in vision, etc. Camphor oil in large doses is used to overcome the infection and because it is thought to be a heart stimulant. It is given in about 10 c.c. doses.

Symptomatic Treatment: When the cough is dry, various cough remedies such as ammonium chloride or solution of ammonia and anise are given to increase expectoration. When the cough is excessive, codeine, luminal, heroin and other similar preparations are given to lessen coughing. When the cough is spasmodic in character, terpin hydrate or heroin and similar preparations are used.

The pain in the chest is usually treated by strapping the chest with adhesive plaster. Some physicians order applications of a mustard plaster or flaxseed poultice.

When the cyanosis is very marked, and in severe cases, inhalations of oxygen are given. A tank of oxygen is kept at the bedside and the patient inhales the gas at frequent intervals through a cone and rubber tube attached to the tank. In some hospitals the patient is placed in a specially constructed room which is kept constantly filled with oxygen. The oxygen usually clears up the cyanosis and some physicians believe that it has a beneficial effect on the course of the disease.

Treatment of Complications: Tympanites, the most common complication, may frequently be prevented by giving daily colon irrigations throughout the course of the illness. When it develops, turpentine stupes are applied to the abdomen, various cathartic enemas, or irrigations with asafetida, turpentine, etc., are given. In severe cases pituitrin injections are usually administered hypodermically.

Dry pleurisy is usually treated by strapping the chest to relieve the pain. Pleurisy with effusion usually subsides gradually. If it causes a great deal of shortness of breath and cyanosis, the fluid is aspirated.

Empyema is usually treated surgically. Unresolved pneumonia is treated by plenty of fresh air and sunlight, by Alpine lamp applications, and by potassium iodide given by mouth. Cardiac complications are treated by heart stimulants such as digitalis or caffeine. Nephritis, meningitis and other complications are treated by the usual methods for these conditions.

INFLUENZA OR GRIPPE

Influenza or grippe is an acute infectious disease which usually occurs as a pandemic, that is, an epidemic which spreads over the entire world. After a pandemic, grippe or colds become more prevalent for several years, especially in cold and wet seasons.

The first serious pandemic occurred in 1889, and began in Russia and then spread over the entire world from East to West. In 1918, during the World War, a very serious form of the disease, with an unusually high mortality rate, occurred as an extensive pandemic throughout the world.

Cause: The specific cause of the disease is unknown, but it is probably an ultramicroscopic poison or germ. The Influenza bacillus, the Streptococcus, the Pneumococcus, and similar organisms may be associated causes of the disease or produce its complications. The disease is transmitted by direct contact with patients or by their secretions.

Pathology: The disease process usually affects the upper respiratory tract and the lungs, and consists of a severe inflammation.

Symptoms

The symptoms begin suddenly, with headache, intense exhaustion, pains in the back and joints, and a rise in temperature and rapid pulse. There is a profuse discharge from the nose with continual sneezing. Frequently the infection extends into the bronchial tubes, causing bronchitis, which produces cough and profuse greenish purulent expectoration. The severe cases are often characterized by marked cyanosis of the skin.

As a rule, the symptoms last a few days and gradually subside, leaving the patient weak and exhausted for days or weeks afterwards.

Complications: The most serious complication is bronchopneumonia. In epidemics it occurs in a severe form which is often fatal.

Sinus infection (an inflammation of the cavities in the bones

in the head) is a common complication which may cause a purulent discharge from the nose for weeks. Otitis media, an inflammation in the ear, and mastoiditis, are serious complications.

Myocarditis, nephritis, and nervous symptoms, such as neurasthenia, depression or melancholia, frequently follow an attack.

The 1918 epidemic was followed by an epidemic of encephalitis or sleeping sickness.

Uncommon Forms

Gastrointestinal Grippe: This is a form of influenza which principally affects the intestinal tract. It is characterized by nausea, vomiting, abdominal pains and diarrhea, with slight fever and intense exhaustion. The symptoms may last for weeks.

Nervous Form: This is an uncommon form of the disease which is characterized by headache, pain in the back and joints, high fever and profound prostration without the usual throat or lung symptoms.

Treatment

The essential treatment is rest in bed, even when the symptoms are very mild. The patient should be kept warm and thoroughly covered to prevent pneumonia. A light diet is usually ordered, and a brisk cathartic is given at the onset of the disease. The remedies usually administered are salicylates, phenacetin, aspirin, and similar coal-tar substances and whisky. Some physicians give large doses of sodium bicarbonate and colon irrigations. If bronchopneumonia develops it is treated in the usual manner.

The gastrointestinal form is treated by a liquid or semi-solid diet, by colon irrigations, and when there is diarrhea, remedies such as bismuth and tannic acid preparations.

The nervous form is treated by rest in bed and sedatives.

CHAPTER IX

TUBERCULOSIS

Tuberculosis is an infectious disease caused by the Bacillus Tuberculosis. It is usually a chronic disease, but an acute form may develop during its chronic course.

Cause

The causes of the disease are specific and predisposing.

Specific Cause: Tuberculosis is caused by the tubercle bacillus. The germ is a short bacillus, very resistant to acids, but readily destroyed by sunlight.

Transmission: The disease is transmitted by patients suffering with active pulmonary tuberculosis, when their sputum contains tubercle bacilli. These patients may spread the disease to others by using the same dishes or utensils or by handling food. The tubercle bacilli may also be scattered in the atmosphere by dried expectorated sputum.

Tuberculosis frequently occurs in the children of tuberculous parents, because they live in the same house and use the same dishes, towels and other utensils as their parents, and are in daily contact with them.

Some forms of tuberculosis are transmitted by milk which has become contaminated with tubercle bacilli. It is also believed that the tubercle bacillus sometimes enters the body through the tonsils.

Predisposing Causes: The disease is more prevalent among the young, especially between the ages of 18 and 25. The most common predisposing causes are undernutrition, fatigue, and sleeping or living in poorly ventilated homes or in rooms formerly inhabited by tuberculous patients. The children of tuberculous parents are also more susceptible because of their weaker constitution. The old idea that tuberculosis was hereditary has been given up because the children of tuberculous parents will not develop the disease if they live away from home under proper hygienic surroundings.

The disease sometimes follows various acute infections such as measles, whooping cough or typhoid fever.

Pathology: The tuberculous process consists essentially in the formation of a characteristic tiny nodule or tubercle, hence the disease is called tuberculosis.

Whenever the tubercle bacilli lodge in any organ they form tubercles. At first the tubercles are tiny nodules, possibly no larger than bird seed. Each tubercle consists of a group of small round cells, sometimes with a larger or giant cell among them which attempt to destroy the tubercle bacilli. If the bacilli are not destroyed the center of the tubercle degenerates, producing a characteristic cheesy appearance. Sometimes several small nodules coalesce, forming larger tubercles. A cavity often results from degeneration of a large tubercle. Progressive pulmonary tuberculosis is characterized by such cavity formation in the lungs. When the tuberculous process is overcome, the tubercles are changed to scars, often with a deposit of lime salts in the center.

Tuberculosis affects principally the lungs, the lymph nodes, the intestines, the meninges or coverings of the brain, the bones, the kidneys, and other organs.

Clinical Forms

Tuberculosis occurs in two forms:

1. Acute Tuberculosis.
2. Chronic Tuberculosis.

Acute Tuberculosis

Acute Tuberculosis occurs in two forms:

1. Acute Miliary Tuberculosis, or Acute Tuberculous Septicemia.
2. Acute Pulmonary Tuberculosis, or Tuberculous Pneumonia.

Chronic Tuberculosis

Chronic tuberculosis is usually classified according to the organs which are principally affected, as follows:

1. Chronic Pulmonary Tuberculosis.
2. Tuberculosis of the Lymph Nodes.
3. Tuberculosis of Bone.
4. Tuberculosis of the Peritoneum.
5. Tuberculous Meningitis.
6. Tuberculosis of the Genitourinary tract.

Tuberculosis may also be classified according to the method of treatment, as follows:

1. Medical Tuberculosis consists of Acute Tuberculosis and Pulmonary Tuberculosis.
2. Surgical Tuberculosis comprises all the forms of tuberculosis usually treated surgically, such as Tuberculosis of Bone, of the Lymph Nodes, of the Kidneys, Genito-urinary tract, etc.

ACUTE MILIARY TUBERCULOSIS

Acute miliary tuberculosis is an acute infection caused by the tubercle bacillus. The disease is really a tuberculous septicemia or bacteriemia.

Cause: The disease usually develops in the course of chronic tuberculosis when a tuberculous nodule in the lung or a tuberculous lymph node degenerates, and the tubercle bacilli enter the blood stream.

Pathology: The tubercle bacilli lodge in various organs of the body. The organs affected are the lungs, meninges or peritoneal cavity. They become studded with fine tubercles known as miliary tubercles, because they are as large as a millet or grass seed.

Symptoms

The symptoms occur in three forms:

1. Typhoid form.
2. Pulmonary form.
3. Meningeal form.

Typhoid Form: The typhoid form resembles typhoid fever. The symptoms develop gradually, the temperature steadily rises and is continuous or irregular, and the pulse is rapid. The abdomen is distended, there may be a characteristic rash, and the spleen is enlarged. The Widal Test is usually negative and no typhoid bacilli are found in the blood stream. The illness may continue for weeks, with the characteristic but progressive apathy of typhoid fever, and the patient finally dies.

Pulmonary Form: The pulmonary form frequently follows whooping cough or measles and begins gradually with the symptoms of an ordinary bronchitis. The cough and expectoration increase, however, and the sputum is often bloody or rusty. The temperature gradualllly rises to 102° or 103° F., there is a rapid

pulse and considerable shortness of breath and cyanosis. The condition gets steadily worse and finally a bronchopneumonia develops, which may be fatal.

Meningeal Form: Tuberculous meningitis is a form of acute miliary tuberculosis which occurs especially in children between the second and fifth year. It may follow an attack of whooping cough or measles, or develop from tuberculosis of the bronchial lymph nodes; and in adults, from other forms of chronic tuberculosis.

Symptoms: The symptoms may be divided into two stages:

1. Stage of irritation.
2. Stage of paralysis.

Stage of Irritation: The symptoms begin gradually. The child loses steadily in weight, becomes restless and irritable and the disposition changes. Suddenly the temperature rises and the child complains of intense headache and vomits. The vomiting is of the projectile type, that is, it occurs suddenly, without warning, even when the stomach is empty, or at night. Sometimes the rise in temperature is accompanied by convulsions. The child has night terrors and cries and screams at night, probably because of the headache.

Stage of Paralysis: The temperature persists, the pulse becomes slow, the child begins to be drowsy and develops rigidity and retraction of the neck. Sometimes twitchings of the muscles or convulsions occur. Finally paralysis of various muscles sets in. The location and extent of the paralysis depends on the extent and location of the tuberculous process in the brain. The paralysis usually involves the eye muscles or facial muscles. The pupils become dilated and the child may become blind. As the disease progresses the child gradually goes into coma and dies.

The characteristic signs of tuberculous meningitis are the same as those of any other form of meningitis, and they consist principally of rigidity of the neck and a Kernig sign, which is inability to extend the leg when the thigh is flexed. The spinal fluid obtained by a lumbar puncture is usually cloudy. It comes out with considerable pressure and usually contains tubercle bacilli.

Treatment

Acute miliary tuberculosis is usually a fatal disease. It is treated according to the predominant symptoms. The typhoid form is treated like typhoid fever, the pulmonary form is treated

like pneumonia. The meningeal form is treated like other forms of meningitis principally by repeated lumbar punctures to remove the infected spinal fluid.

ACUTE TUBERCULOUS PNEUMONIA

Acute tuberculous pneumonia, or "galloping consumption," is a form of acute tuberculosis characterized by the development of a bronchopneumonia.

Cause: The disease usually occurs in the course of chronic tuberculosis when an old tuberculous focus suddenly becomes active.

Pathology: The tubercle bacilli produce a bronchopneumonia. The lung rapidly undergoes degenerative changes with the formation of small or large cavities.

Symptoms

The symptoms are similar to those of pneumonia, but the patient has a cough and loss in weight for some time before the onset. The temperature rises gradually and cough and expectoration, which is frequently bloody, develop. The respiration is rapid, the patient has shortness of breath and cyanosis. The symptoms persist, and instead of improving by the usual crisis or the temperature subsiding by lysis, the patient gradually gets worse, and may die within a few weeks.

Sometimes the condition becomes chronic. The temperature persists, there is a steady loss in weight, cough and expectoration may last for months and finally the patient dies.

The tuberculous nature of the disease is indicated by the presence of tubercle bacilli in the sputum and the fact that the pneumonia has a tendency to involve the upper lobes of the lung.

Treatment

The disease is treated like any other form of pneumonia, but the usual precautions should be taken to prevent spreading the infection. When the acute stage is over, fresh air and overfeeding are the principal methods employed.

CHRONIC PULMONARY TUBERCULOSIS

Chronic pulmonary tuberculosis, or consumption, is one of the most common forms of pulmonary tuberculosis, and, indeed, of any form of tuberculosis. The specific cause is the tubercle

bacillus, while the predisposing causes are principally poor hygiene, fatigue and undernutrition.

Pathology: The disease process affects the lungs, the pleura or the bronchi. In children it frequently begins with tuberculosis of the bronchial lymph nodes. When it affects the lungs it usually begins in the apices, since this part of the lung is poorly inflated in the act of breathing. The process begins with the formation of very fine tubercles in the apices or on the pleura. Gradually some of the tubercles coalesce, forming larger ones. Finally cheesy degeneration of many of the tubercles takes place.

If the resistance of the patient is good, or suitable forms of treatment are carried out, the process heals by scar formation in the tubercles, and deposits of lime salts within them. The resulting scars frequently produce adhesions between the lung and the chest wall.

If the process does not heal, the cheesy degeneration continues and cavities form. As the disease progresses the entire lung becomes affected. The extension of the process may cause ulceration of a blood vessel, which produces hemorrhage. In terminal cases the process involves the larynx, often causing ulceration.

Clinical Forms

Chronic tuberculosis occurs in the following three forms or stages:

1. Incipient Tuberculosis.
2. Chronic Ulcerative Tuberculosis.
3. Chronic Fibroid Phthisis.

This classification into stages merely indicates the nature or progress of the disease. The incipient tuberculosis is usually mild and in many cases the process is arrested and makes no further progress. In other cases the disease goes on to ulceration of the lungs, while chronic fibroid phthisis is a chronic form with a tendency to slow healing. The cases of tuberculosis commonly seen may be divided into two groups: arrested and active. An **arrested case** is one in which the process is healed. An **active case** manifests the usual symptoms of the disease and is often progressive.

Incipient Tuberculosis

The symptoms of incipient tuberculosis begin gradually and are so variable and mild that the nature of the disease is often overlooked. The patient gradually loses weight and complains of weakness. There may be a slight rise in temperature, princi-

pally in the afternoon, while in the morning it may even be subnormal. The appetite is poor and there may be various digestive disturbances such as nausea, distention with gas, or sometimes vomiting. The patient gradually develops a cough, with mucoid expectoration, especially in the morning, and sometimes pain in the chest.

When the patient is examined there may be slight evidence of the tuberculous process in the apices of the lung. Sometimes tubercle bacilli are found in the sputum and the X-ray examination may show slight shadows, indicating an early process.

Some cases develop with repeated attacks of pleurisy, either a dry pleurisy or pleurisy with effusion. These patients have pain in the chest, a dry cough, and when pleurisy with effusion develops there may be shortness of breath.

If the disease is not arrested in the incipient stage, it progresses to the second or ulcerative stage.

Chronic Ulcerative Tuberculosis

This is the usual form in active progressive cases. It begins with the symptoms of incipient tuberculosis, which steadily grow worse. The cough and expectoration increase, the patient loses weight and strength, develops night sweats and becomes anemic. Frequently acute infections develop in the lung in addition to the tuberculosis and this causes a rise in temperature with purulent expectoration.

When the patient is examined, the doctor finds evidence of extensive destructive changes in the lung. There may be small consolidated areas in the lung or cavities of various sizes. Tubercle bacilli are almost invariably found in this stage. The X-ray examination of the chest indicates the location and extent of the destructive changes within the lung.

Complications: The following complications may develop in the course of chronic ulcerative tuberculosis:

1. Secondary infections.
2. Hemorrhage.
3. Perforation of the lung.
4. Acute tuberculous pneumonia.
5. Acute miliary tuberculosis.
6. Tuberculosis of the larynx.

The secondary infections are infections of the tuberculous areas in the lung by other bacteria such as the pneumococcus, strepto-

coccus and others. It is these infections which probably cause the temperature and profuse purulent expectoration, common symptoms of many of the cases.

Hemorrhage may occur in all stages of pulmonary tuberculosis. Some cases are characterized by frequent hemorrhages. When the hemorrhage is slight the only sign is blood-tinged sputum. When it is extensive the patient expectorates large quantities of frothy blood and manifests all the general symptoms of hemorrhage such as a rapid pulse, weakness, air hunger and anemia. A severe hemorrhage is usually due to ulceration into a large blood vessel.

Perforation of the lung results when the tuberculous process is near the pleura. The ulceration suddenly opens up some of the air sacs in the lung and one side of the chest becomes filled with air, causing a pneumothorax. When pus also enters the chest, pyopneumothorax develops.

The symptoms of pneumothorax are a sudden attack of pain in the chest with severe shortness of breath, cyanosis and cough. When the physician examines the patient he may elicit a characteristic drumlike sound on tapping the chest. If fluid is also present he hears a characteristic splashing sound when he listens to the chest while shaking the patient from side to side.

Acute tuberculous pneumonia and acute miliary tuberculosis often develop in the course of chronic ulcerative tuberculosis. They have already been described.

Tuberculous laryngitis causes swelling, thickening and progressive ulceration of the vocal cords and the neighboring structures. The patient becomes hoarse, and has severe pain on swallowing. It is usually a terminal condition and the patient seldom lives longer than a year when this complication has developed.

Chronic Fibroid Phthisis

Chronic fibroid phthisis is a form of tuberculosis which occurs in patients who have good resistance. The patients gradually overcome the infection by slowly forming connective tissue within the lung. The affected lung or portions of it become changed to thick, scarlike tissue with calcified areas throughout the lung.

Symptoms: The patient complains of a chronic cough for years. The cough is associated with expectoration of large quantities of mucous and purulent material. The bronchial tubes may become dilated and a condition known as bronchiectasis develops. This is characterized by attacks of expectoration of

enormous quantities of purulent material until the dilated bronchus is empty. As the scar tissue within the lung increases the lung contracts and the chest may become deformed.

The patient may live for years, suffering only from the lung symptoms, while his general health is not severely impaired.

Tests for Tuberculosis

Tuberculosis is often recognized by finding the tubercle bacilli in various excretions and by various tests.

Examination of Excretions: A positive diagnosis of tuberculosis is usually made when tubercle bacilli are found in the sputum or in other secretions such as the urine, wound secretions, etc.

Tuberculin Test: This consists of injecting gradually increasing doses of tuberculin, an extract made from ground-up tubercle bacilli. The test produces a local, focal and a general reaction. The local reaction consists of an area of redness at the site of injection. The general reaction consists of a rise in temperature and the symptoms of slight fever. A focal reaction consists of an increase of the signs of tuberculosis in the lung. The physician recognizes this change when he examines the patient's lungs.

Von Pirquet Test: This test consists of applying a few drops of tuberculin on a scratch mark on the skin. If the patient has tuberculosis, an area of redness with pigmentation develops.

OTHER FORMS OF TUBERCULOSIS IN THE CHEST

Tuberculosis frequently involves the pleura, the bronchial lymph nodes and the pericardium.

Tuberculous pleurisy is a common form of tuberculosis which usually forms a pleurisy with effusion. Pulmonary tuberculosis often begins with a pleurisy.

Tuberculosis of the bronchial lymph nodes is a form of tuberculosis common in children. The enlarged and swollen lymph nodes produce pressure on neighboring structures. The symptoms are chiefly sudden attacks of coughing at night. Sometimes the swollen lymph nodes obstruct the blood vessels and cyanosis and shortness of breath may occur.

Tuberculous pericarditis is an uncommon form of tuberculosis which involves the pericardial sac. It is described under pericarditis (see page 227).

TUBERCULOSIS OF OTHER ORGANS

Tuberculosis may affect other organs of the body than the lungs. The lymph nodes, bones, peritoneum, intestines, kidneys and urinary tract are frequently affected.

Tuberculosis of the Lymph Nodes or Scrofula: The lymph nodes are commonly affected by tuberculosis, especially in children. This type of infection is believed to enter through the tonsils or adenoids. The disease process consists in the formation of tubercles in the lymph glands, followed by cheesy degeneration and abscess formation. It affects principally the glands in the neck, the glands in the abdomen and the bronchial lymph glands.

When the glands in the neck are involved the lymph nodes become large, swollen and adherent to one another or to surrounding structures. Frequently tuberculous abscesses form in some of the glands and may open spontaneously, leaving a discharging sore or sinus.

The treatment is principally surgical. The diseased lymph nodes in the neck are removed by operation. The injections of tuberculin, the use of Alpine light treatment and sunlight treatment are other methods commonly used in addition to the usual fresh air and intensive feeding carried out in tuberculosis.

Tuberculosis of the Bones and Joints: Tuberculosis frequently affects the bones and joints.

Pott's Disease is tuberculosis of the spine characterized by tuberculous destructive changes of the bodies of the vertebræ. It produces the characteristic deformity of the hunchback.

Tuberculosis of the hip or knee causes severe destructive changes of the bones of the hip or knee joint, producing characteristic deformities.

Tuberculosis of the bones and joints is usually treated by orthopedic means: by various braces, plaster jackets, and sometimes by operation. The object of the treatment is to keep the parts at rest until healing takes place. In addition the usual treatment of tuberculosis is carried out.

Tuberculous Colitis: Chronic tuberculous colitis is a form of tuberculosis involving the large intestine or colon. It is frequently complicated by ischio rectal abscess. The disease will be described under diseases of the large intestine.

Tuberculous Peritonitis: Tuberculous peritonitis is a chronic form of tuberculosis characterized by the formation of cheesy

tubercles within the peritoneum. The disease will be described under diseases of the peritoneum.

Tuberculosis of the Genitourinary Tract: This is a chronic form of tuberculosis which involves the urinary tract: the bladder, the ureter and the kidneys. It is usually treated surgically and will be described under disease of the kidneys.

TREATMENT OF TUBERCULOSIS

The treatment of tuberculosis may be divided into two parts:

1. Prevention.
2. Treatment.

Prevention: There is no disease in which preventive measures are so important as in tuberculosis. The tremendous reduction in the mortality rate in the last twenty or thirty years has demonstrated the efficacy of Public Health measures in reducing the incidence of the disease. Tuberculosis may be prevented by living under proper hygienic conditions; plenty of fresh air and sunshine, an abundance of good nourishing food, sufficient sleep in well-ventilated rooms, and frequent open-air exercise.

The transmission of the disease may be prevented by instructing tuberculous patients in proper personal hygiene. The Board of Health in most large cities does not allow tubercular patients to engage in occupations requiring the handling of foods, such as waiters, grocers, dairymen, etc.

It was formerly believed that tuberculosis was hereditary, but this idea has now been abandoned. The children of tuberculous parents may be prevented from contracting the disease if they live away from home, under proper hygienic conditions. A number of special institutions known as preventoriums have been established for this purpose. When rooms occupied by tuberculous patients are vacated they should be thoroughly cleaned, fumigated and repainted to prevent transmitting the disease to the new occupant.

Treatment

The main object of treatment in tuberculosis is to increase the resistance of the patient. This is accomplished by overfeeding with plenty of good nourishing food, such as milk, cream, eggs, fats, etc., by rest, and by living in the open. The efficacy of this method was first demonstrated by Trudeau, who observed that when guinea pigs, injected with tubercle bacilli, were placed in a dark damp cellar, without nourish-

ing food, they would invariably die. On the other hand if they were well fed and kept in the open air with plenty of sunshine, they recovered.

The disease is best treated in special sanatoriums provided the patient's financial and social conditions permit; otherwise treatment may be carried out at home.

The methods of treatment usually employed are the following:

1. Hygiene.
2. Climate.
3. Diet.
4. Tuberculin treatment.
5. Medicinal treatment.
6. Treatment of Special Symptoms and Complications.
7. Special Methods of Treatment.

Hygiene: A tuberculous patient should be instructed to expectorate in a small paper cup, which should be disinfected and then burned. The patient should have separate dishes and individual towels. If possible, paper dishes and paper napkins and towels should be used, which should be burned after use. The mode of life should be free from cares and worries, especially financial worries. The patient should sleep on a sleeping porch if possible; otherwise the sleeping room should be well ventilated and the windows kept wide open during summer and winter. Active exercise and fatigue are to be avoided. The patient should abstain from smoking and alcoholic drinks.

Climate: The best results in treating tuberculosis are obtained in a dry climate and a high altitude. There are various parts of the country where tuberculous patients are frequently sent, such as the Adirondacks and the Catskill Mountains of New York, Colorado, Arizona, Southern California, and other places. In Europe, Switzerland is a popular place. The climate, however, is not so important as proper hygiene. Excellent results are frequently obtained even in large overcrowded cities when the patients get plenty of fresh air, rest and a diet of large quantities of milk, eggs and fats. The economic and social difficulties of sending a patient to a new environment without friends and with financial worries may neutralize the effect of the climate. Sometimes fresh-air treatment can be carried out by keeping the patient in an improvised tent on the roof of a dwelling or apartment house. Artificial sunlight is frequently given by means of an Alpine or Quartz lamp.

Diet: The diet in tuberculosis consists principally of milk,

cream and eggs and other fattening and easily digested foods in sufficient quantities to provide about 4,000 calories a day. A diet rich in calcium is sometimes used.

Tuberculin Treatment: Tuberculosis of the lymph nodes or tuberculosis of the bones or joints is sometimes treated by very small doses of tuberculin given at frequent intervals.

Medicinal Treatment: There are very few remedies which are of definite benefit in tuberculosis. Cod-liver oil is frequently used as a tonic and preparations of creosote and guiacol are given because of their antiseptic properties in the lungs. Calcium preparations are sometimes used to stimulate healing in the tubercles. They are given by mouth or by intravenous injections.

Symptomatic Treatment: The symptoms which require treatment are excessive cough and temperature. The excessive cough is treated by codein or various cough mixtures and sometimes by inhalations of steam with benzoin, creosote, oil of pine needles or other substances.

Anemia is treated by foods rich in iron and by various tonics containing iron and arsenic.

The loss of appetite usually improves under fresh-air treatment, but it is sometimes necessary to administer various tonics to stimulate the appetite.

When temperature occurs the patient is usually kept in bed. It is treated in the same manner as temperature from any other cause. Cold sponges are ordered when the fever is unusually high.

Treatment of Complications: Hemorrhage is often a serious complication. When a severe hemorrhage occurs, the patient is put to bed, the foot of the bed is elevated and no food is given, only ice pills. The patient is kept quiet by means of morphine To increase blood clotting a transfusion is given or injections of horse serum, and calcium lactate by mouth. Ergot is sometimes ordered to contract the bleeding vessels in the lung.

Acute infections in the course of tuberculosis are treated in the same manner as acute infections from any other cause.

Pneumothorax is treated by rest in bed until the air is completely absorbed.

Tuberculous laryngitis is usually treated by inhalations of steam containing various medicinal substances. Sometimes cocaine is applied to the larynx to relieve the pain on swallowing, which is a distressing symptom.

Special Methods of Treatment: Artificial pneumothorax is a method frequently used in pulmonary tuberculosis when other

measures fail. It is performed by inserting a needle into the chest and allowing 100 to 300 c.c. of air or nitrogen gas to enter gradually by means of a special apparatus. This causes collapse of the lung and promotes healing. The method can only be used when there are no adhesions between the lung and the chest wall.

Surgical Tuberculosis: The forms of surgical tuberculosis are treated by various operations or by applying casts or braces to keep the affected parts at rest. At the same time the usual routine of fresh air, overfeeding and rest are employed.

CHAPTER X

SPECIFIC INFECTIONS OF THE NERVOUS SYSTEM

The following group of diseases are infections which affect various parts of the nervous system.

EPIDEMIC CEREBROSPINAL MENINGITIS

Epidemic cerebrospinal meningitis, sometimes called spotted fever, is an acute infectious disease, caused by a specific germ, the meningococcus. It affects principally the meninges of the brain, and produces symptoms indicating involvement of various parts of the nervous system.

Cause: The disease is caused by the meningococcus, a small round germ. It is transmitted by patients suffering with the disease or by carriers in whose nasal secretions the bacteria are found. The disease usually occurs in epidemics, which are more prevalent in the winter and spring, principally in the United States, and in Europe. It is more common in children, especially those who live in poor tenement districts.

Pathology: The disease process is an acute inflammation of the meninges or membranes which cover the brain and spinal cord. The inside of the ventricles of the brain are also inflamed. The inflammation forms pus around the brain and spinal cord and within the cells of this pus the germs may be found.

Symptoms

The essential symptoms are fever, a hemorrhagic or petechial rash and symptoms produced by involvement of various parts of the brain and spinal cord and their coverings.

Onset: The illness begins suddenly with headache, vomiting and a rise in temperature. The vomiting increases and is projectile in character. It is a sudden violent expulsion of the stomach contents and occurs without warning, at any time during the day or even during the night. The patient is irritable and restless, complains of pains, and the neck becomes rigid. The fever is irregular and is usually not very high, 100° or 101° F., though

sometimes it reaches as high as 106°; and the pulse is quite rapid. There are usually fever blisters around the lips (herpes). A characteristic feature of the disease is a rash, which consists of small hemorrhagic spots or petechiæ, scattered over the entire skin.

Brain Symptoms: The symptoms indicating inflammation of the brain may be divided into two stages:

1. A stage of irritation.
2. A stage of paralysis.

Stage of Irritation: The symptoms of brain irritation are variable and are due to the formation of pus between the meninges and the cortex of the brain. The child lies in bed with the head bent backwards, the body rigid, and is very sensitive to light, sound and touch. He is restless and sometimes there are twitchings and convulsions.

Stage of Paralysis: This stage is characterized by paralysis of various groups of muscles and involvement of special senses. The eye muscles frequently become paralyzed and the eye may turn out or "cross eyes" develop. Twitchings of the muscles of the face or other parts of the body may also be noticed. The pupils are dilated and blindness may develop. In some cases deafness results. As the disease progresses the patient gets drowsy, and stupor and Cheyne Stokes breathing develop. Finally the child goes into coma and dies.

Objective Symptoms: The objective symptoms which indicate meningitis are rigidity of the neck, a Kernig sign, increased knee jerks and other reflexes, and finding the meningococcus in the spinal fluid.

The Kernig sign is the inability to extend the leg when the thigh is flexed on the abdomen. The physician elicits this sign by bending the thigh on the abdomen and then attempting to extend the leg.

Lumbar Puncture: This is a method for obtaining a specimen of the fluid from the spinal canal. A special needle is inserted between two lumbar vertebræ into the spinal canal and the spinal fluid then flows out. In meningitis the fluid flows under pressure. It is cloudy and contains pus and the meningococci may be found within the leucocytes of this pus.

Course: The disease usually lasts about three to six weeks or longer and is frequently followed by various complications and sequellæ. Occasionally very acute cases occur in which the patient dies within a week.

Complications

The most common complications of epidemic meningitis are pneumonia, chronic basilar meningitis and chronic hydrocephalus.

Pneumonia frequently develops in severe cases and may be the cause of death.

Chronic basilar meningitis is a chronic inflammation at the base of the brain, which develops when the disease is of long standing. It is characterized by opisthotonus, a condition in which the spine is bent backward, and various visual disturbances such as blindness and paralysis of the eye muscles.

Chronic hydrocephalus is a complication characterized by progressive enlargement of the head due to the accumulation of fluid in the skull and ventricles of the brain.

Sequelæ: If the disease is treated early with the specific serum the patient may recover completely. Sometimes, however, persistent headache, partial or complete blindness, deafness or mental symptoms may remain.

Treatment

The methods of treatment may be divided into preventive measures, specific treatment and nursing care.

Prevention: During an epidemic every case should be properly isolated and the nasal secretions of every patient should be thoroughly disinfected and destroyed.

Specific Treatment: Epidemic meningitis is frequently cured, especially when treated early, by the proper use of antimeningococcus serum or Flexner's serum. This is usually administered by injection into the spinal canal. A lumbar puncture is performed and about 10 to 30 c.c. of fluid is withdrawn from the spinal canal. A similar quantity of antimeningococcus serum is then injected into the canal. The injections are repeated twice daily for several days if the symptoms do not improve. The early use of the serum has markedly reduced the mortality rate of this very serious disease.

Nursing Care: The patient should be strictly isolated, and separate dishes, utensils, linens, etc., should be used. The room should be kept dark because the patient is very sensitive to light. The nasal secretions should be handled carefully, disinfected, and thoroughly destroyed. The nose is usually irrigated with normal salt solution or sprayed with various antiseptic solutions.

Feeding: The diet is the usual fever diet. It is sometimes

necessary to feed by rectum or through the nose because the child will not take any food.

Symptomatic Treatment: Repeated lumbar punctures are sometimes used as a method of treatment, to remove as much of the infectious material as possible. When the patient is delirious or has convulsions sedatives are often ordered.

Treatment of Sequelæ: Chronic basilar meningitis and hydrocephalus are treated by repeated lumbar punctures. Chronic hydrocephalus is sometimes treated by puncturing the brain to remove the fluid. The blindness and deafness are usually not amenable to treatment.

INFANTILE PARALYSIS

Infantile paralysis, or acute anterior pyliomyelitis, is an acute infectious disease characterized by paralysis of the muscles, especially in the extremities.

Cause: The disease is probably caused by an ultramicroscopic organism which is usually found in the nasal secretions. There are probably some children who act as carriers, harboring the germs in their nasal secretions continually. The disease occurs especially in children under three years of age and only occasionally in adults.

Pathology: The disease process consists principally of an infection and destruction of the anterior part of the gray matter in certain areas of the spinal cord. The function of these centers is to send impulses to the muscles for contraction. Consequently, when some of these areas are destroyed, the muscles to which they send impulses are unable to contract and are paralyzed. The paralysis is usually permanent, since cells of the gray matter in the spinal cord or brain, when once destroyed, are never restored.

Symptoms

The symptoms usually appear in two stages, separated by a short normal interval, as follows:

1. A stage of mild fever.
2. A stage of paralysis.

Stage of Fever: The symptoms of the first stage are a slight rise in temperature, constipation, a sore throat, vomiting and diarrhea. These symptoms may be slight or entirely absent and this stage may therefore pass unnoticed. It is followed after a few days of normal temperature by the stage of paralysis.

Stage of Paralysis: The symptoms of the second stage are due to destruction of areas of gray matter in the spinal cord. They begin with extreme tenderness or sensitiveness to touch, or convulsions, or rigidity of the neck. This is followed by paralysis of some of the muscles. The muscles of the lower extremities are usually affected, but the extent of the paralysis is very irregular. In some cases an entire limb becomes paralyzed, while in others only a few muscles of a limb. Occasionally the muscles of the back, the abdominal muscles or the facial muscles are affected. The original paralysis gradually improves, but some of the muscles remain permanently paralyzed. In severe cases the disease involves the respiratory muscles, causing a disturbance in breathing which may be fatal.

Sequelæ: The permanent paralysis in the affected muscles prevents their development. As a result the contractions of the opposing muscles causes various deformities. When the legs are involved, club feet, flat feet, or flail limb result. As the child grows the affected limb remains shorter than the other because the centers for nutrition in the spinal cord are usually involved and the growth of the affected limb is checked.

Treatment

The treatment may be divided into three parts:

1. Treatment of the Acute Stage.
2. Treatment of the Paralysis.
3. Treatment of the Sequelæ.

Treatment of the Acute Stage: In the acute stage the patient is usually isolated as soon as the diagnosis is made. If he is in a ward in a hospital, the bed should be screened and all the usual precautions for preventing transmission should be carried out. The patient should have separate dishes, separate linens, etc. All the excretions, especially the nasal secretions, should be disinfected and destroyed. A lumbar puncture is frequently done to remove as much of the infectious material as possible, and to relieve pressure from the spinal cord.

Treatment of the Paralysis: The muscles which are permanently paralyzed are treated by massage, exercises and various forms of electricity to increase their strength and development.

Treatment of Sequelæ: Deformities which often follow the disease are treated by means of plaster casts and various surgical operations.

ENCEPHALITIS LETHARGICA OR SLEEPING SICKNESS

Encephalitis Lethargica, or Sleeping Sickness, is an acute infectious epidemic disease which affects the brain. The severe cases are characterized by prolonged coma.

Cause: The specific cause of the disease is unknown, but it is believed to be due to a poison so small that it can pass through the finest filter. The poison or germ is probably similar to the one which causes infantile paralysis; some physicians believe that they are the same organism. The disease is of recent origin; the first extensive epidemic occurred in 1918. There have been a number of epidemics since that time and they have all followed epidemics of influenza, which is therefore believed to be a predisposing cause.

Pathology: The disease process is an acute inflammation of various portions of the cortex of the brain and the ganglia or centers within the brain. In some cases the spinal cord is also affected. The infection permanently destroys many of the cells in the gray matter of the brain or spinal cord.

Symptoms

The disease begins very slowly and insidiously and the symptoms are principally those of an acute infection with varied symptoms and sequelæ indicating involvement of the brain.

Fever: The symptoms of the infectious process are chiefly fever. It is usually slight and irregular and lasts only a few days, but the temperature is sometimes very high. The patient feels weak, tired and perspires excessively.

Brain Symptoms: The symptoms indicating brain involvement may be very few or many and are extremely variable. They begin with headache, dizziness, restlessness and insomnia. The disease runs a long course and as it progresses other symptoms develop, whenever specific areas in the cortex of the brain become involved.

In some patients twitchings of groups of muscles such as the abdominal muscles or the muscles of the hands develop, and occasionally even convulsions occur. Paralysis of various muscles may cause the eye to turn out or produce "cross eyes." The facial muscles frequently become paralyzed. In some cases an arm or a leg may become paralyzed (monoplegia). Sometimes the entire side of the body may become paralyzed (hemiplegia). Some patients develop mental symptoms, such as loss of mem-

ory, emotional disturbances, etc. Rigidity of the neck may develop if the meninges or coverings of the brain are affected.

A characteristic feature of the disease, and the symptom from which its name is derived is increasing drowsiness, which may develop into stupor and coma.

Sequelæ: The inflammation of the brain destroys many centers of gray matter. When the cells of these centers are once destroyed they do not regenerate, consequently certain forms of permanent brain disease or various symptoms of disturbed brain function often remain.

Paralysis agitans, or Parkinson's Syndrome is the most common sequel of the disease. It is characterized by a shuffling gait, drooling of saliva, slow speech, a blank facial expression and a characteristic twitching of the hands.

Insomnia and various other disturbances of sleep sometimes develop after the attack. In children, behavior difficulties may result. Various mental symptoms such as lack of concentration, drowsiness, mental depression and even insanity have developed after encephalitis.

Treatment

The disease is treated principally by rest in bed, a proper nourishing diet, and measures to relieve symptoms of disturbed brain function as they occur. The physician performs frequent lumbar punctures to remove the infectious fluid through the spinal canal and to relieve headache and other symptoms.

If twitchings and convulsions occur, various sedatives are given. If paralysis develops, it is treated by massage, electricity, etc. The sequelæ are treated by various methods according to the form of brain disease which results.

CHAPTER XI

UNCOMMON INFECTIOUS DISEASES

The following diseases are uncommon infections. Most of them are common diseases of animals. They sometimes develop therefore among persons who handle animals or animal products.

HYDROPHOBIA OR RABIES

Hydrophobia, Rabies, or Lyssa is a fatal, acute infectious disease characterized by muscular spasms of the head and neck.

Cause: The disease is probably caused by a germ which has not yet been isolated. It is evidently present in the saliva, because the disease is transmitted by the bite of a mad dog suffering with rabies. It may also result from the bite of other animals such as the fox, wolf or cat.

Pathology: The organism affects principally various ganglia or centers in the nervous system. Certain characteristic microscopic particles known as Negri bodies are found in the brain of an animal or person who died of rabies.

Symptoms

The incubation period is from six to eight weeks, usually about seven weeks.

The symptoms begin with a brief premonitory stage, consisting of inflammation around the wound, headache, irritability and depression.

This is followed by a stage of brain irritation, which consists of spasms of the muscles of the neck, throat and larynx. The spasms are reflex in character and are brought about by a bright light or sound, or any irritation. The fact that a drink of water will cause a spasm gives the disease its name, hydrophobia. There is usually a rise in temperature to 100° or 103° F., and the pulse is rapid. This stage lasts from one to three days.

The stage of paralysis is the terminal stage, and lasts only a few hours. The spasms now stop, the patient becomes drowsy and develops stupor and dies in a final coma.

Treatment

The treatment of hydrophobia is principally preventive. The disease may be prevented by muzzling dogs so that even if they should develop hydrophobia they cannot transmit the disease by biting.

When a patient is bitten by a dog who is believed to have hydrophobia the dog should not be killed but should be watched carefully. If the dog has hydrophobia he will die within a few days of the characteristic symptoms of the disease. The very long incubation period, about six to eight weeks, gives ample opportunity for preventive inoculation. If the dog has been killed the brain should be sent to a laboratory to be examined for the presence of Negri bodies, which definitely indicate hydrophobia.

Pasteur Treatment: This is the specific preventive treatment for hydrophobia. It consists of a series of injections of a solution made from dried spinal cords of dogs who died of hydrophobia. The principal of the treatment is the fact that drying the affected cord weakens the poison of hydrophobia, and the longer the cord is dried the weaker the poison becomes. Consequently the treatment is started with weak solutions made from cords dried for a long time. Gradually stronger solutions are injected, that is, solutions made from cords dried for shorter periods.

Local Treatment: The wound resulting from the bite of a dog suspected of having hydrophobia should be cauterized at once with a strong acid such as pure nitric acid.

Treatment of the Spasms: When hydrophobia has once developed it is usually fatal. The spasms are usually treated by the administration of chloroform and their recurrence may be prevented by the administration of sedatives such as bromides, luminal, morphine, chloral, etc.

TYPHUS FEVER

Typhus fever or typhus exanthematicus is an acute infectious disease characterized by a hemorrhagic rash and a two weeks' fever ending by crisis. The disease is sometimes called Ship Fever, Jail Fever, or Camp Fever to indicate that overcrowding is a cause, and sometimes Spotted Fever to indicate its rash.

Geographical Distribution: The disease occurs especially in Serbia, Russia and Mexico. Brill's Disease is a mild form of

typhus fever which has occurred in New York City. The disease frequently occurs in severe epidemics. One of the severest epidemics in history was in the nineteenth century. The last epidemic occurred during the World War in Serbia.

Cause: The disease is believed to be due to the Bacillus Typhus Exanthematici, a germ which is transmitted by lice. It is therefore prevalent in localities where poor undernourished people are crowded together in unsanitary jails, camps, or ships.

Symptoms

The incubation period is twelve days. The essential symptoms are very high fever, lasting two weeks, which ends by crisis, associated with a characteristic rash.

The disease begins suddenly, with a severe chill, pain in the back and severe prostration. The temperature rises rapidly to 102° to 103° F., the pulse is rapid and bounding, the face is flushed, the skin is dry and all the symptoms of fever are present. On the third to the fifth day a rash appears; first on the chest, then on the extremities and face. The rash consists of small red spots in which small hemorrhages or petechiæ develop, hence the disease is sometimes called Spotted Fever.

The temperature keeps on rising steadily, finally reaching 106° or 107° F. by the second week. The patient is now markedly prostrated, the cheeks are flushed, and the pulse and respiration are very rapid. There is usually delirium and a dull stupor or lethargy. In favorable cases the fever drops suddenly, the mind becomes clear and the patient gets well. In unfavorable cases instead of a crisis the lethargy continues, the patient goes into coma and dies.

Treatment

Prevention: The disease may be prevented by proper sanitation of institutions or camps and avoiding overcrowding. Delousing of persons living in such places is an effective means of preventing transmission of the infection. A vaccine made from the causative germ has been tried.

Symptomatic Treatment: The disease is treated like typhoid fever by remedies and measures which relieve symptoms. The temperature is treated by cold packs or coal-tar remedies. A high caloric diet is ordered to increase the resistance of the patient. The bowels are usually moved thoroughly and various intestinal antiseptics such as sulphocarbolates and similar substances are usually given.

ANTHRAX

Anthrax or Wool Sorter's Disease is a serious, fatal, acute, infectious disease caused by the Bacillus Anthracis. It is usually a disease of cattle, but it occasionally occurs in butchers, tanners, and those who handle wool or animal hairs.

Cause: Most of the cases of anthrax which have occurred in recent years have resulted principally from the use of unsterilized shaving brushes which were evidently made from hairs of infected animals.

Pathology: The disease process consists in the formation of a characteristic pustule, which becomes gangrenous in the center and is followed by septicemia.

Symptoms

The symptoms occur in three forms:

1. Skin or Local Anthrax.
2. Gastrointestinal Form.
3. Pulmonary Form.

Local Anthrax, or Malignant Pustule: This form of anthrax results especially from infected shaving brushes. A very severe boil with a bluish gangrenous center develops on the face. The symptoms of severe septicemia develop rapidly with a high temperature and the patient dies in a few days.

Gastrointestinal Form: This is a form of anthrax which develops from eating infected meat. The symptoms are a severe chill, vomiting, diarrhea, and a hemorrhagic rash with petechiæ.

Pulmonary Form: Wool Sorter's or Rag Picker's Disease is a form of anthrax which affects the lungs. It occurs particularly in Russia and South America. The organism is probably inhaled with the dust of infected rags. The principal symptoms are a chill, fever, cough, very rapid breathing, vomiting, diarrhea and extreme prostration.

Treatment

Anthrax is treated by preventive measures, by a specific serum, and by isolation.

Preventive Treatment: Anthrax may be prevented by disinfecting hides and hair brushes, by proper inspection of meat and by suitable measures to prevent inhalation in those occupa-

tions in which wool or rags are handled. Its occurrence in animals may be prevented by inoculating them against anthrax with the specific antianthrax serum.

Local Treatment: The anthrax pustule is usually treated by an extensive incision and applying carbolic acid in the wound.

Specific Treatment: Antianthrax serum is a specific remedy for anthrax. An initial dose of 80 to 100 c.c. is given intramuscularly or intravenously, followed by 20 c.c. doses at frequent intervals.

Isolation: The patient is usually isolated and all the discharges or dressings should be disinfected and burned. The nurse should wear rubber gloves when handling a patient with anthrax.

GLANDERS OR FARCY

Glanders or Farcy is an acute infectious disease caused by the Bacillus Mallei. The disease occurs among horses, but it sometimes develops in persons who frequently come in contact with horses. The disease is characterized by the formation of ulcerating nodules which have a foul discharge. It occurs in two forms:

1. Glanders.
2. Farcy.

Glanders is a form of the disease in which the nodules occur in the nose. Farcy is a form in which they occur in the skin. The disease may be acute or chronic.

Acute Glanders is characterized by a foul smelling, ulcerative discharge from the nose. The process extends rapidly and the patient may die within a week or ten days.

Chronic Glanders is a disease characterized by a foul smelling characteristic discharge from the nose which may last for months.

Acute Farcy is a serious illness characterized by the formation of peculiar small ulcerating buds in the skin. The disease extends to the deeper tissue, forming an extensive abscess followed by a rapidly fatal infection.

Chronic Farcy is characterized by the formation of peculiar small lumps in the skin which form abscesses and ulcers that do not heal readily.

Treatment: The disease is treated by extensive incision and cauterization of the buds and then applying various antiseptic solutions to the wound.

ACTINOMYCOSIS

Actinomycosis is a chronic disease characterized by a chronic purulent discharge.

Cause: The disease is caused by a species of fungus known as the Ray fungus, or the Streptothrix Actinomyces. It frequently develops among persons who come in contact with cattle or who eat infected food.

The disease process consists in the formation of a characteristic nodule with a degenerated center in which the causative fungus is found.

Symptoms

The disease may affect the lungs, the mouth, or the skin.

The pulmonary form is characterized by cough and a purulent expectoration. It resembles a chronic bronchitis, but the Ray fungus is found in the sputum.

When the disease occurs in the mouth there is marked swelling of the jaw, with destruction of the soft tissues and bone. It sometimes affects the skin of the face around the mouth. It resembles tuberculosis.

Actinomycosis of the brain has been described, with symptoms like those of a brain tumor.

Treatment: The treatment is largely surgical. The abscesses are opened and drained. Sometimes X-ray or radium is applied over the infected areas. The pulmonary form is treated by large doses of potassium iodide.

RELAPSING FEVER

Relapsing Fever constitutes a group of acute infectious diseases caused by various spirochetes. The disease is characterized by short periods of fever, alternating with normal intervals of the same duration. Trench Fever is a form of relapsing fever which occurred during the last war.

Cause: The most common cause is the Spirochete of Obermeier but other spirochetes may cause similar fevers. The disease is transmitted by lice and bedbugs and it is therefore more prevalent in unsanitary localities.

Symptoms: The incubation period is from five to seven days. The disease begins suddenly with dull pain in the back and vomiting. The temperature rise to around 104° F., and is accompanied by sweats and a rapid pulse. The fever lasts five or six days; the temperature then drops by crisis and the patient com-

plains of intense weakness. During the paroxysm the spirochetes may be found in the blood, and the spleen is enlarged. The patient remains apparently normal, for about five or six days, and then he gets another chill with fever and sweats. These periodic attacks may occur for four or five weeks.

The disease is treated by the measures ordinarily used to relieve fever.

MALTA FEVER

Malta Fever is a rare disease caused by the Micrococcus Malitense. The disease occurs especially in Gibraltar, Malta, and the neighboring regions of the Mediterranean Sea. It is therefore also called Neapolitan Fever or Rock Fever.

The symptoms may last for months and consist of short attacks of fever, lasting a few days, associated with swelling of the joints and excessive perspiration. Between the attacks the patient is apparently normal.

The disease is treated like other fevers.

ROCKY MOUNTAIN FEVER

Rocky Mountain Fever is an acute infectious disease characterized by pain in the back associated with temperature. The disease is believed to be caused by a minute parasite, which is transmitted to humans from horses and cattle by means of an insect called a tick. The disease occurs in the mountainous regions of Montana, Idaho, Nevada, Wyoming and Texas.

Symptoms: The incubation period is from three to ten days. The patient has a sudden chill with pains in the back, and the temperature rises to 103° or 105° F. A hemorrhagic rash resembling that of typhus fever usually appears on the seventh day. In severe cases there is delirium and stupor.

The disease may be prevented by cleaning and scouring the horses in order to destroy the ticks. When the symptoms are manifest they are treated by the usual measures and remedies for fever.

CHAPTER XII

INFECTIOUS DISEASES CAUSED BY ANIMAL PARASITES

MALARIA

Malaria is an infectious disease caused by an animal parasite, the Plasmodium Malariæ, and is characterized by periodic attacks of chills, fever and sweats. It is usually an acute disease, but it may occur in a chronic form.

Cause: The disease is caused by the presence in the blood of a protozoan parasite, the Plasmodium Malariæ. The organism occurs in three forms:

1. The Tertian form, which develops into a full-sized parasite in 48 hours.
2. The Quartan form, which develops in 72 hours.
3. The Aestivo Autumnal form, a special form of parasite.

The disease is transmitted by the bite of a species of mosquito, the Anopheles mosquito. When this mosquito bites a patient suffering with malaria, or a malarial carrier, it sucks up some of the blood containing the parasites. The organisms then go through a special cycle of development in the body of the mosquito, finally lodging in its salivary gland. When this mosquito now bites a normal person he injects some of the secretion containing the parasite into the patient's blood.

Malaria, like other infectious diseases, is sometimes transmitted by carriers who are cured cases whose blood still contains malarial parasites.

The disease is very prevalent in the tropics and in Italy, hence it is frequently called Roman Fever. It occurs especially in swampy regions because the larvæ of the mosquitoes develop in shallow, stagnant pools.

Pathology: The parasites are injected into the blood by the bite of the mosquito. They enter the red blood corpuscles, where they grow and develop, forming eighteen or twenty parasites. This takes forty-eight hours in the Tertian type and seventy-two hours in the Quartan type of the disease. At the end of that

time the red blood corpuscles rupture, the new parasites are suddenly thrown into the blood stream and the patient gets a chill and fever.

Symptoms

The symptoms of malaria are periodic attacks of chills and fever, followed by profuse sweats.

The attack begins suddenly. The patient feels cold, shivers, and has a very severe chill. The face and hands are cold and blue. Sometimes there is nausea and vomiting. The chill is followed by a sudden rise in temperature, 104° to 106° F., a rapid pulse and a throbbing headache. The temperature and pulse remain elevated for one-half to several hours and are followed by profuse perspiration, after which the patient feels well again.

The attacks occur every day if the disease is due to a Tertian parasite or every third day if it is due to the Quartan parasite. Quotidian malaria is a form of malaria in which the patient has chills, fever and sweats every day. It is due to an infection with two Tertian parasites, one producing chills and fever on one day and the other on the following day.

Aestivo Autumnal fever, or Remittent fever, is a form of malaria which is prevalent in the tropics. It occurs especially in the late summer or fall. The chills and fever may occur on alternate days or the patient may have an irregular, continuous or remittent fever. It is caused by a special type of parasite, which looks like a crescent when examined under the microscope.

Objective Symptoms: A positive diagnosis of malaria is usually made by finding the malarial parasites in the blood. After a chill the blood usually contains enormous numbers of parasites. During the attack and for some time after it is over, the spleen is usually enlarged.

Unusual Forms of Malaria

Malaria may occur in unusual forms such as Black Water Fever or Chronic Malaria.

Black Water Fever, or Paroxysmal Hemoglobinuria is a form of malaria which occurs especially in the tropics. It is characterized by the presence of hemoglobin in the urine after the attack, hence the name. The urine is of a bright red color, and transparent. The color is due to hemoglobin which is excreted in the urine as the result of destruction of enormous numbers of red blood corpuscles by the malarial parasites.

Chronic Malaria or Chronic Malarial Cachexia is a chronic

condition produced by malaria. The symptoms are persistent temperature, occasional shortness of breath on exertion, slight swelling of the ankles, an enlarged spleen, and sometimes attacks of bleeding from the bowels or vomiting of blood.

Complications: The disease is sometimes complicated by frequent relapses, severe anemia, or jaundice.

Treatment

The treatment of malaria consists of prevention, various measures to relieve the attacks, and specific treatment.

Prevention: Malaria may be prevented by destroying the larvæ of the Anopheles mosquito and by treating carriers. The swamps in malarial districts should be drained and the larvæ of the mosquito should be destroyed by pouring crude oil, kerosene, carbolic acid or caustic soda into all swamps and pools. All windows should be screened. Malarial carriers or patients who have recently recovered from an attack should be given quinine regularly, especially in the spring and summer. The administration of five grains of quinine every day will often prevent the disease in a malarial district. When other measures fail, malaria may be prevented by moving to a region where the disease is not prevalent.

Treatment of the Chill: A patient with a malarial chill should be put to bed immediately, wrapped in plenty of warm blankets, and a hot water bag should be applied to the feet. Hot drinks or whisky are usually given. When the attack is over a saline purgative and specific treatment is usually ordered.

Specific Treatment: Quinine is the specific remedy for malaria. When it is given in sufficiently large doses the disease is cured; the chills and fever subside and the malarial parasites disappear from the blood. Quinine may be given by mouth, in capsules, pills or in liquid form. Some physicians order it given before the expected chill while others give it after the chill is over. The dosage usually ordered is 20 to 30 grains a day for the first three days and smaller doses after that. The preparations commonly used are quinine bisulphate, quinine sulphate, or quinine hydrochloride. In severe cases quinine is sometimes given hypodermically, intramuscularly or even intravenously. For this purpose the preparations used are quinine and urea hydrochloride, quinine bichloride, quinine chloride, or quinine dihydrochloride. They are usually given in 15 to 40 grain doses dissolved in 300 to 500 c.c. of normal saline solution.

Patients who live in malarial districts are often advised to take quinine for a few months every year, especially during the seasons when the disease is prevalent. In the Aestivo Autumnal form, larger doses, and intensive treatment is usually ordered.

There are some cases of malaria that do not respond to treatment with quinine. They are often treated by large doses of arsenic or by salvarsan (arsphenamine) given intravenously.

Black Water Fever is usually treated by quinine, but it must be given in very small doses and the urine carefully watched. Malarial Cachexia is treated by a change of climate and the administration of quinine and arsenic preparations. Anemia, which is a frequent complication of malaria, usually improves when the malaria is cured, although treatment with iron and arsenic, especially the latter, is frequently continued.

SYPHILIS

Syphilis or lues is a chronic, progressive, infectious disease caused by the Spirochete Pallida.

Cause: The specific cause of the disease is the Spirochete Pallida or Treponema Pallidum, a spiral-shaped animal parasite. Syphilis is a venereal disease which is usually transmitted by the genital organs. Occasionally, however, it is transmitted by handling infected towels or syphilitic secretions or by operating on a syphilitic patient. This form of syphilis is sometimes spoken of as "syphilis of the innocent."

Pathology: The disease process occurs in three stages:

The first stage consists in the formation of a characteristic sore, which is known as the chancre or initial lesion. It appears within a month after infection.

The second stage develops about three to six weeks. During this stage the spirochetes circulate in the blood stream, a characteristic rash develops, mucous patches form in the mouth, and the lymph nodes become enlarged.

The third stage consists in the formation of gummata or characteristic syphilitic processes, in various organs, in the blood vessels or other tissues. A gumma is a mass of small round cells which degenerates and becomes softened in the center. A syphilitic process or gumma may develop in almost any organ of the body, but it occurs principally in the brain, the spinal cord, the heart, the liver and the blood vessels.

Symptoms

The symptoms may be divided into three stages:

1. The Primary Lesion or First Stage.
2. The Stage of Rash and Mucous Patches, or Second Stage
3. The Tertiary Stage.

First Stage

The first stage is characterized by the development of the chancre or primary lesion. This is a small or large, hard ulcer with a peculiar glazed surface. It occurs especially on the genital organs. In female patients it may occur on the cervix. In "syphilis of the innocent" it may occur on the lips, hands or other parts of the body. The chancre lasts about three weeks.

Second Stage

The symptoms of the second stage develop in about three to six weeks after the first stage. The principal symptoms are a characteristic rash, mucous patches in the mouth and throat, and enlarged lymph nodes. Sometimes fever and rheumatic pains in the bones occur. In some cases the iris of the eye is affected, forming adhesions, which causes an irregular shaped pupil.

The Eruption: The rash, or roseola, is the most important feature of the second stage. A typical eruption is reddish brown or raw ham in color; it occurs principally on the back and does not itch. The individual spots are slightly elevated papules. Sometimes the rash is scaly, especially when it occurs on the hands.

Mucous Patches: These are small whitish or grayish patches, sometimes with a slightly ulcerated border. They occur principally on the inner side of the cheeks, on the tongue or on the pillars of the tonsils. The throat and mouth are sore and the tonsils are red and swollen.

Tertiary Stage

The symptoms of the third stage may occur months or years after the original infection. The patient may develop symptoms at any time during his life if he has not been successfully treated. The symptoms result from the formation of gummata in various organs of the body, or to syphilitic deposits in the blood vessels. The organs principally affected are the brain, the spinal cord, the heart, the blood vessels, the liver, the bones, and occasionally other organs.

Brain Syphilis: The syphilitic process may involve specific areas of the brain or the entire brain and spinal cord. When the motor areas on one side of the brain are affected, hemiplegia or paralysis of the opposite side of the body results. If only a portion of the motor area is involved, a monoplegia or paralysis of an arm or leg may develop. Frequently a generalized syphilitis meningitis occurs with the symptoms of brain irritation such as continual headache and paralysis of various muscles, the eye muscles, the facial muscles, etc. Sometimes blindness or deafness results from syphilis of the brain.

General Paresis: General paresis is a syphilitic disease of the cortex of the brain. It is characterized by mental symptoms: grandiose ideas, delusions, etc., followed by intense weakness of all the muscles. The disease is frequently associated with other forms of syphilis of the brain and is usually fatal within a few years.

Locomotor Ataxia: Locomotor ataxia or tabes dorsalis is a syphilitic disease of the spinal cord. It is characterized by a peculiar incoördinated gait, shooting pains in the muscles, symptoms of incoördination in the hands, eye symptoms and various crises, that is, sudden attacks of pain in the organs of the abdomen. As the disease progresses incontinence of urine and stool develop.

Cerebrospinal Syphilis: This is a form of syphilis of the nervous system which affects both the brain and spinal cord, sometimes one organ more than another. It produces symptoms of brain involvement as well as those of the spinal cord.

Vascular Syphilis: Syphilis frequently affects the blood vessels. It is the most common cause of aortitis or aneurysm of the aorta. It is probably also an important cause of many cases of arteriosclerosis.

Cardiac Syphilis: Syphilitic disease of the heart is very common. It affects principally the coronary arteries, the valves, or the heart muscle. The symptoms produced by syphilitic heart disease are similar to those of other forms of heart disease. Angina pectoris is often due to syphilis.

Syphilis of the Liver: This often causes a large, nodular, irregular shaped liver. The bile ducts and sometimes the blood vessels within the liver become obstructed. The symptoms are described under diseases of the liver.

Syphilis of the Bones: An extensive destructive syphilitic process may affect the nasal bones and the septum of the nose.

The nose becomes indented and is shaped like a saddle, a condition called "saddle back nose." It frequently occurs in children suffering with congenital syphilis.

Syphilitic Ulcers: Syphilis often causes ulcers on the leg, forehead or other parts of the body. The ulcers have a characteristic punched out appearance and are often very deep, extending to the bone.

Syphilis of the Special Senses: Syphilis is a common cause of blindness and deafness. The blindness may result from syphilitic involvement of the optic nerve, the eyes or the iris of the eye. Syphilis sometimes causes permanent deafness or blindness.

Syphilis and Pregnancy: Syphilis may cause sterility, either in the male or female. A woman who is infected with syphilis may have repeated miscarriages. She may give birth to a dead child or a child who develops symptoms of syphilis early or late in life.

Congenital Syphilis: A child of syphilitic parents may develop symptoms of syphilis in early childhood or at the time of puberty. The symptoms of congenital syphilis are variable. As a rule, the child develops a bloody discharge from the nose, snuffles, ulceration of the nose, and a saddle back nose. The lymph glands and the liver become enlarged. A characteristic symptom is Hutchinson's teeth. This is a condition in which the edges of the upper frontal teeth of the second set become notched. Sometimes skin eruptions develop. Interstitial keratitis, a syphilitic condition of the eye, is a common symptom. Permanent deafness and mental deficiency in children is frequently due to syphilis.

Pemphigus of the newborn is a form of congenital syphilis which may occur within the first six months of life. It is characterized by the formation of extensive blisters all over the body. The child usually dies within one or two weeks after it appears.

Tests for Syphilis

A positive diagnosis of syphilis is made by finding the spirochetes in the chancre or initial sore and by the Wassermann test.

The spirochetes may be found when the secretions of the chancre are examined with Dark Field Illumination, a method of examining microscopic slides while the light passing through the microscope is dimmed.

The Wassermann test is a complicated blood test for syphilis. A positive result of the test is usually reported as four plus, three

plus, two plus or one plus reaction. A four plus reaction indicates a severe form of the disease, while the other results are produced by mild forms or when the disease improves under treatment.

The Wassermann test is positive in some patients even when they have had a syphilitic infection many years ago and have not been completely cured.

When syphilis affects the nervous system, the spinal fluid will also give a positive Wassermann reaction with a maximum result usually reported as ten plus.

Treatment of Syphilis

The treatment of syphilis may be divided into prevention and specific treatment.

Prevention: The prevention of syphilis is largely a matter of educating the public in the dangers and serious consequences of the disease, and in methods of prevention. In most large cities the physician must report cases of syphilis to the Board of Health in order to prevent spreading the disease. Adequate control is impossible, however, because of inherent social difficulties.

Methods for Preventing Transmission: The discharge from the chancre, the secretions of the mouth when mucous patches are present, and the nasal discharges, usually contain spirochetes. The ideal method of treatment is therefore proper isolation of every patient suffering with active syphilis. The patient should have separate dishes, separate towels, linens, and bed pans, which should be disinfected after use. All discharges should be disinfected and burned. A nurse attending a patient with active syphilis should wear a gown and rubber gloves. She should be especially careful in handling the linens, towels and utensils used by the patient. In most cases, isolation is not possible, however, and the patient should therefore be instructed in the methods of proper hygiene to avoid spreading the disease to others. A syphilitic patient is usually advised not to marry until he has been treated for at least two years and until his Wassermann test remains negative.

The cases that show the terminal effects of syphilis, such as aneurysm of the aorta, syphilis of the brain, syphilitic heart disease, etc., cannot transmit the disease. They merely suffer from the end results of the original infection which they may have had many years ago.

Specific Treatment: Syphilis is a disease which can be cured

by various specific remedies, such as arsphenamine or salvarsan, mercury preparations, bismuth preparations and potassium iodide. Arsphenamine, mercury and bismuth preparations are used principally in the first and second stages of the disease, while potassium iodide is used in the later or third stage of the disease.

Arsphenamine or salvarsan is usually given by direct injection into a vein. The frequency of the administration and the size of the dose is modified according to the severity of the disease or the method used by the physician. In the early stages the injections are usually given once a week. Some preparations of arsphenamine, such as sulpharsphenamine, are given by intramuscular injections.

The mercury preparations are given by intramuscular injections, by inunctions or rubbings, by mouth, or as vapor in a special cabinet. The most common method of giving mercury is by intramuscular injections of mercury salicylate, mercury cyanide, mercury in oil and similar preparations.

The inunction method consists of rubbing mercury ointment (blue ointment) on the skin every day for a week, but each day on a different part of the body. The arms, the legs, the back and the chest are the usual places for inunction treatment. At the end of a week the patient takes a bath and then the course is started again.

When mercury is given by vapor, the patient sits in a special cabinet in which mercury vapor is formed by burning calomel, which is absorbed by the skin.

Some physicians give combinations of mercury and iodides by mouth, such as the biniodide or the protoiodide of mercury.

The patient's teeth should be in excellent condition before beginning treatment with mercury, which often affects the teeth. The continued use of mercury may cause symptoms of poisoning; soreness and bleeding of the gums, excessive flow of saliva and in severe cases diarrhea with bloody stools. The treatment is usually stopped temporarily when any of these symptoms develop.

Bismuth preparations such as bismuth tatarate and similar substances have recently been introduced as a remedy for syphilis. They are usually given intramuscularly.

Potassium iodide is an old standard remedy for the treatment of syphilis, especially for the symptoms of the third stage. It is given in increasing doses, reaching in some cases as much as 3i a day; and syphilitic patients can usually tolerate large doses.

Local Treatment: A local syphilitic process such as an ulcer or rash is usually treated by applications of mercury ointments or solutions. On the face, arms or other exposed parts of the body, ammoniated mercury ointment or yellow oxide of mercury ointment is applied.

Effect of Treatment: The use of mercury, salvarsan, potassium iodide or bismuth preparations in syphilis usually causes a prompt disappearance of all the visible signs of the disease, such as the initial sore or chancre, the rash, the mucous patches, the enlarged lymph nodes, and all the other symptoms. The spirochetes, however, are still present in the body, and although there are no visible symptoms, the disease is still latent and symptoms may break out at any time during the patient's life. The only evidence of a more or less permanent cure is a persistent negative Wassermann reaction. Consequently every syphilitic patient is treated intensively until the Wassermann test becomes negative. In most cases this takes two or three years. A patient who has had syphilis should be examined by his physician at frequent intervals, even after he is apparently cured, and a Wassermann test should be done repeatedly. If there is any evidence of recurrence, early treatment may then prevent a sudden development of some serious disease of the nervous system, heart, or blood vessels.

CHAPTER XIII

WORMS

Worms are parasites which frequently enter the human body and cause disease. They occur in two forms: as a fully developed worm or as a larva. The fully developed worms usually occur in the intestinal tract while the larvæ occur in the muscles or other organs of the body. The larvæ of some worms occur in a different animal than that in which the adult forms are found. The animal in which the larvæ develop is called the intermediate host. For example, tape worms frequently develop in the intestinal tract of human beings, but the larvæ occur in the muscles of the pig which is the intermediate host. Worms are prevalent especially in tropical climates.

INTESTINAL WORMS

The most common worms which occur in the intestinal tract are the following:

1. Thread Worms.
2. Round Worms.
3. Tape Worms.
4. Hook Worms.

The diagnosis of the particular type of intestinal worm is made by finding pieces of the worm or its eggs in the stool.

THREAD WORMS

Thread worms or Oxyuris Vermicularis are tiny round worms which sometimes occur in the rectum or large intestine of children. They probably develop from eating vegetables contaminated with the eggs of the worm.

The principal symptoms are itching around the anus and genitals, especially at night, because the worms come out of the rectum and lay their eggs. The worms and their eggs may be found in the stools.

The disease is treated by enemas of salt solution, infusion of quassia, tannic acid, alum, lime water or quinine.

ROUND WORMS

Round worms or Ascaris Lumbricoides are small cyindrical worms which occur especially in the duodenum of the small intestine in children.

The essential symptom is the presence of the eggs of the worm in the stool. Sometimes the child grinds his teeth or picks his nose, because of the irritation of the worm. Convulsions in children are believed by some physicians to be caused by round worms, especially when worms or their eggs are found in the stool and when no other cause is found.

Occasionally an attack of appendicitis or gall bladder colic is caused when the worms enter the appendix or gall bladder.

The disease is treated by santonin, spigelia, or oil of chenopodium.

TAPE WORMS

Tape worms or Tæniæ are long, flat worms which frequently occur in the intestinal tract. They consist of numerous segments joined together to form a long worm, sometimes as long as thirty feet or more. The head of the worm is very tiny, about the size of a pin head, and is usually firmly attached to the mucous membrane of the intestinal tract. Beginning with the head the segments gradually increase in size, finally becoming much broader and larger.

There are two forms of tape worms: Tænia Saginata and Tænia Solium.

Tænia Saginata occurs in beef and is the most common form in the United States. Tænia Solium is a rare form of tape worm occurring in hogs.

The chief symptom of tape worms is the presence of segments of the worm and its eggs in the stools. This is sometimes associated with a very severe anemia.

Tape worms are treated by preparations of aspidium or male fern, cusso, pepo, or pumpkin seeds or pelleterine, or mixtures of these drugs. The remedies are administered after a preliminary starvation period and are preceded and followed by cathartics. After the treatment, it is essential to find the head of the worm in the stools. If the head remains in the intestine it may form a new worm and the symptoms will recur.

HOOK WORM DISEASE

Hook worm disease or uncinariasis is a disease caused by the hook worm or Uncinaria Duodenale or Uncinaria Americana.

Cause: The disease is very prevalent in the southern part of the United States, in Porto Rico, Egypt, and India, especially among children and young adults who go barefoot.

The worm is usually present in the duodenum or jejuunum of the small intestine, where it becomes firmly attached to the mucous membrane by means of small hooks. It then secretes numerous eggs which are constantly present in the stool.

The worm gets into the intestine in an unusual way as follows: The eggs of the worm lodge in the soil from infected stools and develop into larvæ. When children or adults walk barefoot on such soil the larvæ often become attached to the soles of the feet, and cause a peculiar form of irritation called "ground itch." From this area of local infection the worms finally get into the body and lodge in the intestines.

Symptoms: The principal symptoms are lack of energy, laziness, retarded growth and development, malnutrition and especially a severe anemia. The stools contain numerous eggs of the worm.

The original "ground itch" is often present on the feet, legs and sometimes on the arms. It begins as tiny blisters which change to pustules. Gradually the pustules become dry and form crusts.

Treatment: Hook worm disease may be prevented in regions where it is prevalent by wearing shoes and stockings and preventing contamination of the soil by infected stools.

The disease is treated by thymol, which is given in the following manner, a method advised by the United States Public Health Service in the South, and in Porto Rico.

1. A dose of magnesium sulphate is given at night.
2. At 6:00 A.M. several capsules containing five grains of thymol and sodium bicarbonate are given.
3. About two hours later another dose of magnesium sulphate is given.

Carbon tetrachloride, calomel or oil of chenopodium are other remedies frequently given.

Treatment of Intestinal Worms

The intestinal worms are usually treated by the administration of special remedies called vermicides or vermifuges. Vermicides

are remedies which destroy the worms and vermifuges are those which expel them from the intestinal tract.

The remedies for worms are usually administered in the following manner:

1. The patient is kept on a light diet or without food for twenty-four hours before the remedy is given.
2. A laxative such as calomel or Epsom salt is given to move the bowels thoroughly.
3. After the bowels have moved, the specific vermicide or vermifuge, or a mixture of several remedies is administered early in the morning, sometimes together with the laxative.
4. A brisk cathartic, such as calomel or castor oil is then given several hours later to expel the worms.

The starvation is maintained until the bowels have moved thoroughly. Each stool is then carefully examined in order to find the worm and especially its head.

VISCERAL WORMS

There are certain diseases caused by worms lodging in various organs of the body. Trichinosis and Echinococcus disease are the most common diseases caused in this manner. In echinococcus disease the human being is the intermediate host, because the larvæ of the worm develop in the liver, lungs and other organs of the body.

TRICHINOSIS

Trichinosis is a disease caused by the presence in the body of Trichina Spiralis. This is a tiny microscopic worm which commonly occurs in the larval form in the muscles of hogs. The disease is frequently mistaken for typhoid fever.

Cause: The disease is caused by eating smoked or uncooked ham or pork obtained from hogs infected with the worm. When a patient eats such infected meat the larvæ develop into full-grown worms in the intestinal tract. The embryos of the worm then enter the lymphatic vessels and lodge in the muscles between the muscle fibers and finally become surrounded by lime salts.

Symptoms: The symptoms begin with diarrhea and other intestinal symptoms. About a week or two later the patient complains of pains around th joints, in the muscles, and the ankles and eyelids become swollen. The patient becomes dull and apathetic and develops a continuous fever which may last for weeks. A characteristic feature of the disease is the

increase of the eosinophile leucocytes of the blood. The parasites may be found by excising a piece of muscle and examining it with a microscope.

The disease is treated like typhoid fever.

ECHINOCOCCUS DISEASE

Echinococcus disease is a rare disease caused by the Tænia Echinococcus, a small tape-worm which occurs especially in dogs.

The disease is prevalent in Australia and South America and occurs among shepherds or others who are constantly in contact with dogs.

The embryos of the worm enter the intestine and finally migrate into various organs of the body, where the larvæ develop in a peculiar way. They form characteristic cysts which contain smaller cysts, known as daughter cysts, and these in turn contain still smaller cysts.

The cysts occur especially in the liver, forming a large tumor, and cause symptoms of liver disease. They have also been known to occur in the lungs, kidneys and brain.

The disease is treated by a surgical operation to remove the cysts.

CHAPTER XIV

TROPICAL DISEASES

Tropical diseases are infectious diseases which are especially prevalent in tropical or subtropical climates. Some of these diseases prevail in the tropics as the result of poor sanitary conditions, or because these regions are infested with so many insects by which they are transmitted. The diseases are occasionally brought to temperate climates by sailors, travelers, immigrants or infected cargoes from the tropics.

The tropical diseases may be divided into two groups, according to the nature of the parasite which causes them:

1. Bacterial Diseases.
2. Protozoan Diseases.

ACUTE BACTERIAL DISEASES

ASIATIC CHOLERA

Asiatic Cholera is an acute infectious disease caused by the Cholera Bacillus or Spirillum of Koch, and is characterized by profuse diarrhea and severe collapse. It is one of the most serious and fatal diseases.

Cause: The disease occurs especially in Oriental countries, in Arabia, and in India; frequently in epidemics. It is transmitted by a water supply which has become contaminated with the cholera bacillus from the stools of patients.

The disease process is a very severe form of inflammation in the stomach and intestines.

Symptoms

The principal symptoms are severe dysentery associated with intense collapse.

About two to five days after exposure to the infection the patient develops a feeling of illness and severe pains in the abdomen, nausea, vomiting and frequent bowel movements. The diarrhea rapidly becomes very severe and the patient may have

as much as twenty to thirty stools a day. The stools consist principally of fluid which contains milky white particles of mucous membrane, and are therefore called "rice water stools."

The symptoms of collapse result from the loss of enormous quantities of fluid by the stools. The patient becomes very thirsty and extremely weak. The pulse gets rapid and weak, the mouth is dry, the skin is cold and clammy, and the hands and lips are blue, and the output of urine is diminished. When the disease is severe the patient dies within a few days. In mild cases the diarrhea and the symptoms of collapse gradually improve and the patient recovers.

Treatment

The treatment consists of preventive measures, proper quarantine and treatment of the diarrhea and collapse.

Prevention: Cholera may be prevented by proper sanitation and care of the water supply. The disease is transmitted when a water supply becomes infected with contaminated stools of patients. During an epidemic, all the water should be boiled to destroy the germs. All the stools of patients suffering with the disease should be thoroughly disinfected. Preventive inoculation with a vaccine of the specific bacillus is now used.

Quarantine: The patient is strictly isolated and the usual quarantine measures such as the use of special dishes, proper disinfection of stools, etc., are carried out.

Treatment of Diarrhea: The diarrhea is treated by various astringents such as opium and bismuth given by mouth. High colon irrigations are frequently used.

Treatment of Collapse: The collapse is treated by large quantities of fluids and stimulants. The patient should be given as much fluid as he can possibly take; by mouth, or by hypodermoclysis. Coffee, whisky and other stimulants are given frequently.

Diet: The diet usually ordered consists principally of boiled cereals, milk, albumin water and similar foods. No fruits or vegetables should be given.

BUBONIC PLAGUE

Bubonic Plague is an acute infectious disease caused by the Bacillus Pestis. It is characterized by markedly swollen lymph nodes and a severe septicemia with pneumonia. This disease was the cause of the epidemic of Black Plague which

raged in the Middle Ages and destroyed about one-third of the population.

Geographical Distribution: The disease is essentially a disease of the tropics and occurs in India, the Philippines, West Indies, and South America. It is occasionally brought to seaports by sailors or travelers from these regions.

Cause: The Bacillus Pestis which causes the disease is transmitted to humans from rats, principally by fleas. The disease therefore occurs in unsanitary communities where rats are prevalent.

Pathology: The disease process consists principally of enlarged lymph nodes and pneumonia in the lungs. The germs are usually present in the urine and stools.

Symptoms

The symptoms occur in two forms: a septic form and a rapidly fatal pneumonia.

The septic form begins with headache, restlessness, marked depression and a rise in temperature for a few days. All the glands then become swollen and the patient develops a hemorrhagic rash or petechiæ. The temperature subsides and abscesses form in the glands which discharge pus. This causes a secondary rise in temperature and the patient finally dies of severe toxemia and collapse.

The pneumonic form is more serious and is usually fatal. The patient suddenly develops a severe pneumonia and dies in a few days.

Treatment

Preventive measures are proper sanitation and destroying rats in regions where the disease is prevalent, as well as in all incoming and outgoing steamers. Preventive vaccination by a vaccine made from the germ has been tried.

The disease is treated principally by the usual quarantine measures and fever treatment.

CHRONIC BACTERIAL DISEASES

LEPROSY

Leprosy is a chronic infectious disease caused by the Bacillus Lepræ, a germ which resembles the tubercle bacillus.

Geographical Distribution: The disease occurs principally in the Orient, in China, India, the Hawaiian and the Philippine

Islands; frequently as an epidemic. It also occurs in Europe; in Norway, Sweden and certain parts of Russia.

Cause: The lepra bacillus is transmitted by direct contact with patients suffering with the disease. The germs are found in open sores, on the skin and on the mucous membrane of the mouth, and also in the saliva.

Pathology: The structural changes of the disease are the formation of nodules or tubercles, which degenerate and form ulcers. When the ulcers heal they leave a characteristic scar. The tubercles occur on the skin, the nose, the face, and on the nerves.

Symptoms

The disease occurs in two forms:

1. Nodular or Tubercular Form.
2. Anesthetic or Gangrenous Form.

Nodular Form: The nodular form begins with the formation of red sensitive spots on the face, nose and lips, which become pigmented. These spots usually develop into nodules, but they sometimes change to characteristic white spots on the skin. The nodules develop on the face, nose and forehead. As the disease progresses the face becomes changed to a mass of irregular shaped lumps, and the patient develops a peculiar lion-like appearance. The mouth, throat, larynx, the conjunctiva and cornea of the eye finally become affected.

Anesthetic Form: The anesthetic form of leprosy results when the characteristic nodules develop on the nerves or when the nerves become infected with the lepra bacillus.

The symptoms begin with pains in the hands and feet, which become very sensitive (hyperesthetic) or numb. This is followed by anesthesia and complete loss of sensation. In many cases the loss of sensation exposes the skin to injury and irritation. As a result blisters form which change to peculiar leprous ulcers. The involvement of the nerves interferes with the nutrition of the fingers and toes and they become gangrenous and fall off.

Treatment

All cases of leprosy are isolated in a leper colony to prevent transmitting the disease.

The disease is usually treated by Chaulmoogra Oil, which is given in increasing doses from ½ c.c. to 3 c.c. X-ray treatment

and carbon dioxide snow applied to the nodules are other methods frequently used. A vaccine made from the lepra bacillus is sometimes tried.

SPRUE

Sprue or Psilosis is a chronic disease caused by a special kind of mould, the monila. The disease occurs principally in tropical countries, especially in China, India and Java.

Symptoms: The symptoms of the disease are diarrhea, a characteristic inflammation of the tongue, anemia and emaciation.

The diarrhea is not accompanied by pain and occurs especially at night. The patient has frequent, large stools, which contain a large amount of fat.

Treatment: The disease is treated by rest in bed and a diet of lightly cooked meat given four times a day, together with about four pints of hot water. Pancreatic extract is the remedy usually given.

PROTOZOAN DISEASES

AMEBIC COLITIS OR AMEBIC DYSENTERY

Amebic Colitis or Amebic Dysentery is a form of chronic dysentery due to a protozoan parasite, the Entameba histolytica.

Geographical Distribution: The disease occurs particularly in tropical countries, especially in Egypt and India. It is frequently brought to temperate climates by sailors or travelers from the tropics.

Cause: The ameba which causes the disease is an organism made up of a single cell and is transmitted by infected drinking water.

Pathology: The organisms enter the body by the intestinal tract. They lodge in the large intestine and bore underneath the mucous membrane, gradually forming ulcers.

Symptoms

The disease usually runs a chronic course and the principal symptom is diarrhea, which sometimes alternates with constipation. The stools contain mucus and frequently blood. The patient loses weight and develops a severe anemia. The symptoms may improve for a while, but recurrences are very common.

A definite diagnosis of amebic colitis is made by finding the amebæ in the stools. The stool has to be examined at the bedside because the organisms are recognized by peculiar movements which are noticeable only when a fresh specimen of stool is examined microscopically. They cannot be differentiated from other constituents of the stool unless these characteristic movements are seen. The patient should pass the stool in a warm bed pan and a particle of mucus, especially if it is bloody, is placed on a warm slide and immediately examined with a microscope.

Complications: Amebic colitis is often complicated by liver abscess and sometimes by perforation of the intestine, and peritonitis. The liver abscess usually contains the amebæ and other bacteria.

Treatment

Amebic colitis is treated by specific and local remedies and by a suitable diet.

Specific Treatment: Ipecac and its active principal, emetine, are the specific remedies for amebic colitis. Various preparations of ipecac, or emetine iodide are given by mouth in large doses for a period of twenty-four days. Emetine is also given as a course of hypodermic injections for about twelve days twice a day. In severe cases arsphenamine or salvarsan is given intravenously.

Local Treatment: The diarrhea and ulcers in the intestines are treated by various local remedies. Bismuth and tannic acid preparations are given by mouth to check the diarrhea. The bowels are irrigated with solutions of silver nitrate, tannic acid, quinine or other antiseptic substances to destroy the amebæ and heal the ulcers.

Diet: The diet usually ordered consists of bland carbohydrate foods. Meats, vegetables and other foods which leave a good deal of residue are eliminated.

Surgical Treatment: The severe cases are sometimes operated upon. Appendicostomy is an operation in which the appendix is sewn into the wound and the entire large intestine is irrigated with quinine solutions through the stump of the appendix. Sometimes an artificial anus is made in the side of the abdomen to prevent stool from passing through the ulcerated colon. When liver abscesses develop they are usually opened and drained. After the operation the wound is treated by daily irrigation with quinine preparations and emetine is given by mouth.

YELLOW FEVER

Yellow Fever, or Tropical Fever, is a very fatal, acute, infectious disease which occurs in tropical or sub-tropical countries. It is characterized by jaundice, hemorrhages from the stomach, and albumin in the urine.

Geographical Distribution: The disease is prevalent in the West Indies, where it occasionally occurs in epidemics.

Cause: The probable cause of the disease is an animal parasite: a form of spirochete, the Leptospira Icteroides. The parasite is transmitted by the bite of a species of mosquito, the Stegomyia calopus.

Symptoms

The incubation period is from three to five days. The principal symptoms are fever, jaundice, vomiting of blood and albumin in the urine. They usually occur in three stages: an initial fever, a stage of calm, and a secondary fever.

The disease begins suddenly, usually early in the morning, with a chill or chilly sensations, a rise in temperature of 102° to 106° F. The skin rapidly becomes jaundiced, the temperature persists for two or three days, but the pulse is slow. The patient has a characteristic appearance: a flushed face, bright red eyes and an alert expression. A stage of calm then follows, during which the temperature subsides by lysis and stays down for two or three days.

The temperature now rises again and is accompanied by profuse vomiting. The vomited material contains dark blood, hence it is called "black vomit." This secondary fever persists for several days, then it rapidly subsides by lysis and the patient gradually gets well.

The characteristic features of the disease are a slow pulse which gets slower as the temperature rises and the presence of albumin in the urine. In fatal cases there is no period of remission, but the temperature rises steadily, the symptoms get worse and the patient dies.

Treatment

Prevention: Yellow fever may be prevented by destroying the larvæ of the mosquitoes, by disinfecting stagnant pools or other sources, and by isolating patients in screened rooms.

Treatment: The disease is treated by isolation, a proper diet and measures to relieve the various symptoms. The patient is isolated in a screened room to prevent spreading the disease

by the mosquito. The diet consists of light nourishing food. When vomiting occurs only water or cracked ice is allowed by mouth and all food has to be given by rectum. The fever is treated in the usual manner by baths, sponges, etc.

FILARIASIS

Filariasis is a chronic disease caused by the Filaria Bancrofti, and is prevalent in the Orient. The disease is characterized by a peculiar swelling of the legs known as elephantiasis.

Cause: The filaria are transmitted by mosquitoes when they bite patients suffering from the disease.

Pathology: The parasites enter the lymphatic vessels, finally lodging in the lymph vessels or the lymph nodes of the groin or bladder. As they increase in size they obstruct the flow of lymph in the extremities or wall of the bladder. The embryos of the parasites circulate in the blood but only at night.

Symptoms

The disease occurs in two forms:

1. Elephantiasis.
2. Chyluria.

Elephantiasis: This is a condition which results when the lymph nodes in the groin are obstructed by the parasites. One or both legs become markedly swollen and thickened. In males the scrotum is also affected.

Chyluria: This is a condition which results when the parasites obstruct the lymphatic vessels in the bladder. The urine has a milky appearance due to the accumulation of serum in the bladder.

A positive diagnosis of filariasis is made by finding the embryos of the parasites in the blood of the patient. The blood has to be examined at night.

Treatment: The disease is treated by salvarsan, thymol, methylene blue and ichthyol. Elephantiasis is treated by removing the lymph nodes in the groin which contain the adult parasites.

AFRICAN SLEEPING SICKNESS

African Sleeping Sickness or trypanosomiasis is a chronic, infectious disease caused by an animal parasite, the trypanosome.

The disease occurs in Central and Western Africa and is transmitted by the bite of a peculiar fly, the tsetse fly.

Symptoms: The symptoms begin with fever, mental dullness and loss in weight, followed by tremors of the muscles. The terminal stage consists of progressive lethargy. Sometimes meningitis develops with all its usual symptoms. The disease lasts for months, usually about eighteen months or longer.

Treatment: The disease is treated by a newly discovered arsenic preparation, tryparsamide, and sometimes by atoxyl, another arsenic substance. The disease may be prevented from spreading by isolating the patient and exterminating tsetse flies.

DENGUE

Dengue or Break Bone Fever is an acute infectious disease characterized by fever, severe pains in the joints and muscles. It occurs particularly in the tropics and the sub-tropical climates of India and China; frequently in epidemics.

Cause: The specific cause is unknown, but it is evidently transmitted by mosquitoes. The disease usually occurs as a pandemic that spreads rapidly over large areas.

Symptoms: The incubation period is from three to five days. The symptoms begin suddenly; with headache, pain in the back and a rise in temperature to 106° or 107° F. The fever is associated with the most intense pain in the head, the back and eyeballs and particularly in all the joints of the body. The pains are so severe that the patient cannot be moved. The temperature subsides in a few days and there is a short period of remission. A secondary fever then develops and the pains return. Sometimes a characteristic rash appears.

The disease is not serious but the patient complains of stiffness of the muscles and joints for a short time after recovery.

Treatment: The patient is kept in bed and surrounded by screens to prevent transmission by mosquitoes. The salycilates and potassium iodide are the remedies commonly given.

CHAPTER XV

ALLERGIC DISEASES

Allergic diseases are a group of diseases caused by various animal and vegetable proteins, such as the pollens of various plants, emanations of animal hairs or various foods. They develop only in persons who are unusually sensitive to these proteins. The most common diseases due to allergy are hay fever, bronchial asthma, urticaria and angioneurotic edema.

Skin Tests for Allergy: The proteins to which a patient is sensitive may be determined by testing the sensitiveness of the skin to various proteins. This is done by direct application on a scratch mark or by intradermal injections.

The scarification method consists of applying a powder made from the dried protein on a scratch mark on the skin. The injection method consists of injecting 1/100 to 1/50 of a c.c. of a solution of various proteins into the skin by means of a hypodermic syringe and a very fine needle.

The vegetable or animal substances to which the patient is sensitive produce a characteristic "wheal" at the site of application or injection. This is a large white elevated itching area with an irregular border, about one-quarter to an inch in diameter, which fades in several hours. Moderate and slight reactions are smaller wheals which fade more rapidly. If the patient is not sensitive to the proteins no such effect is produced.

Some physicians instil a few drops of a solution of vegetable or animal proteins into the conjunctiva of the eye. A positive reaction consists of redness and swelling of the conjunctiva and a flow of tears.

HAY FEVER

Hay fever, pollinosis or allergic coryza is a disease characterized by periodic attacks of sneezing and congestion of the mucous membrane of the eye. It occurs in two forms: seasonal hay fever and perennial hay fever.

Seasonal Hay Fever

Seasonal hay fever occurs in two forms:

1. Hay Fever.
2. Rose Fever.

Cause: Hay fever is more common, and is caused by the pollens of ragweed or goldenrod, but only in susceptible persons. The susceptibility is often hereditary. It usually occurs in the late summer or early fall, around the first week of August and the middle of September, when these pollens are prevalent.

Rose fever occurs in the spring, from March to July. It is usually caused by the pollens of Timothy grass, Orchard grass, June grass and Red Top. It may also be caused by the pollens of various trees such as the pine, elm, maple, poplar or birch.

Symptoms

The symptoms of seasonal hay fever usually occur only in the season of the year in which the disease is prevalent, and they recur every year at about the same time.

The attack begins with a red inflamed condition of the eye and excessive flow of tears. This is followed by continual attacks of sneezing, with a discharge of a clear serous fluid from the nose. The sneezing is usually worse on windy or dry days, when more pollen is scattered in the atmosphere. As a result of severe and frequent paroxysms of sneezing the patient becomes very irritable and complains of digestive disturbances and feels worn out and exhausted. Some cases of hay fever are associated with asthma.

Perennial Hay Fever

Perennial hay fever or vasomotor rhinitis is an uncommon form of hay fever in which the attacks occur at any time during the year.

Cause: This form is caused by emanations of animal hairs: chicken or goose feathers, horse hair, various vegetable foods, rice, corn, etc., or by eggs, fish, milk or by various drugs. These substances are sometimes contained in the dust of the room.

Symptoms: The chief symptoms of perennial hay fever are mild attacks of sneezing which occur at any time during the year. They are usually associated with simultaneous attacks of asthma or urticaria.

Treatment

Hay fever is treated by the following methods:

1. Preventive Inoculation.
2. Climate.
3. Specific Treatment.
4. Symptomatic Treatment.

Preventive Inoculation: Seasonal hay fever may be prevented by a series of injections with solutions of the causative pollens.

The kind of pollens which cause the attacks are determined by various skin tests as follows: A small amount of the dried extract of various pollens is applied on a scratch mark on the skin or a few drops of a dilute solution of pollens are injected into the skin. The pollens to which the patient is susceptible produce a large elevated itching white spot or "wheal" on the skin at the site of injection.

When the pollen which causes the hay fever is determined, the patient is immunized or desensitized by a series of injections with solutions of this pollen. The treatment is begun about eight or ten weeks before the time when the hay fever attacks usually occur. About twenty injections are given, one every week or ten days, beginning with a small dose of a very dilute solution and increasing the dose with each injection.

Perennial hay fever may be prevented by determining the causative food or animal substance and eliminating it from the diet or environment.

Climate: There are certain climates which are relatively free from hay fever, such as the White Mountains of New Hampshire or certain parts of Vermont, Maine, California or Florida. Some patients are entirely free from attacks if they stay in these places during the hay fever season.

Specific Treatment: Hay fever is frequently cured by a series of hypodermic injections with solutions of the pollens to which the patient is susceptible, even when they are given during the attacks. The injections are given daily or every other day until the attacks are relieved.

Perennial hay fever is treated by eliminating the causative substance from the diet or environment, and sometimes by desensitizing the patient.

Symptomatic Treatment: The principal remedy used to relieve the attack is adrenalin or epinephrine given as a spray, or dropped into the eye. Ephedrine, atropine, belladonna, bromides, estivin, etc., are other remedies frequently used.

ASTHMA

Asthma is a disease characterized by sudden attacks of shortness of breath, wheezing and cyanosis. It occurs in two forms:

1. Bronchial asthma.
2. Symptomatic asthma.

Bronchial Asthma

Bronchial asthma is a form of asthma caused by emanations of various animal hairs such as horse hair, rabbit's hair, down of feathers, or by various vegetable substances, in susceptible individuals.

Cause: The causes of bronchial asthma may be divided into specific and predisposing.

The specific causes are emanations of various animal hairs, such as horse hair, rabbit's hair, cat's hair, dog's hair, the down of chicken and goose feathers. Some cases of asthma are produced by certain vegetable substances such as the pollens of ragweed or timothy, which cause hay fever, or by tobacco or cotton. Occasionally attacks are produced by the dust of a room, or by eating certain foods, eggs, meat or fish.

The predisposing cause is an inherent susceptibility to animal hair emanations or animal or vegetable proteins, which may be hereditary or acquired. The patients who develop asthma frequently also suffer from other forms of allergic disease such as hay fever, hives, or urticaria.

Symptoms

The symptoms of asthma are paroxysms of severe shortness of breath. They are usually brought on by coming in contact with an object that contains the animal hair, food, or vegetable to which the patient is sensitive. A patient who is sensitive to horse hair may develop an attack when he comes near horses, or when he goes into a stable, or rides horseback, or sleeps on mattresses made from horse hair. When he is sensitive to the down of chicken feathers or goose feathers, attacks develop when he sleeps on pillows containing the down of feathers. If he is susceptible to pollens, the attacks occur in the season of the year when pollens are prevalent. If he is susceptible to certain foods, attacks result from eating these foods.

In nervous patients the attack is sometimes brought on by nervous excitement.

The Paroxysm: The attacks usually develop suddenly, especially at night. The patient becomes short of breath and the breathing is accompanied by a peculiar wheezing sound. He is unable to breathe unless he sits in a chair before an open window or holds on to the chair or bed. As the attack increases in severity the patient becomes cyanotic, the wheezing becomes continuous and is sometimes so loud that it may be heard by those about him. He has an anxious look and the forehead is covered with beads of cold perspiration. The attack may last a few minutes or several hours and then it gradually subsides. In mild cases attacks occur occasionally, while in severe cases they occur repeatedly throughout the night or even during the day.

Allergic Tests: These are tests to determine the substances which cause bronchial asthma. A few drops of a solution of various animal hairs or vegetable substances are injected into the skin of the forearm, or a powder made from these substances is applied on a scratch mark on the skin. The substance to which the patient is sensitive produces a characteristic reaction on the site of injection or application. This consists of a white, raised or swollen spot, called a wheal, surrounded by a red area.

Symptomatic Asthma

Symptomatic asthma occurs as a symptom in the course of various diseases of the organs in the chest, such as heart disease, chronic pulmonary tuberculosis, aneurysm of the aorta or chronic bronchitis. It also occurs in chronic sinus disease or gastric disturbances.

Treatment

The treatment of asthma may be divided into prevention, treatment of the attack and medicinal treatment.

Prevention: The preventive measures vary with the cause. If the asthma is a symptom of organic disease of the lungs or the heart, the attacks will often subside when these conditions are successfully treated.

The attacks of bronchial asthma may be prevented if the animal hairs, proteins or other substances which produce the attacks are eliminated from the patient's bed or surroundings or from the diet.

If the patient is found to be sensitive to chicken or goose

feathers he should not sleep on pillows made from the down of these feathers. If he is susceptible to horse hair, he should not sleep on horse-hair mattresses. If the asthma is produced by susceptibility to certain foods, then foods which cause the attacks are eliminated from the diet. When the attacks are produced by pollens of plants, the patient is given preventive inoculations as in hay fever. If smoking or certain odors produce attacks the patient should give up smoking or the objects which produce the odors are eliminated.

If the asthma is not relieved by removing articles containing animal hairs from the room or by a change in diet, the patients are desensitized by a series of injections of solutions containing extracts of the causative animal hairs, foods or vegetable substances.

Hygiene: The patient with asthma should sleep alone in a room. He should eat several light meals a day, with the largest meal at noon instead of at night. He should avoid overeating. The bowels should be moved regularly. The patient should lead a calm quiet life, free from all excitement.

Climate: A patient who gets attacks in a moist changeable climate or from pollens is often greatly benefited when he moves to a dry mountainous region.

Treatment of the Attack: An attack of asthma is usually treated by hypodermic injections of epinephrine or adrenalin. Ephedrine is a new Chinese drug which produces a similar but more lasting effect. It is given by mouth as well as by injections and is believed to be just as effective as adrenalin. During the attack the patient should be allowed to sit up. Some patients get a good deal of relief when the back is rubbed or when the face or back is rubbed with cold wet towels. Sometimes inhalations of steam containing benzoin or other substances relieves an attack.

Medicinal Treatment: The most common remedies used to relieve or prevent the attacks are atropin, belladonna, the fumes of stramonium leaves or cigarettes, pituitrin and large doses of potassium iodide. Occasionally injections of parathyroid extract are given, together with large doses of calcium preparations.

URTICARIA

Urticaria is an allergic skin condition characterized by the formation of "wheals" or large elevated itching spots on the skin.

Cause: The condition is caused by various foods in susceptible patients, especially fish, strawberries or other foods.

Symptoms: The patient suddenly develops spots or wheals on the face, the arms, the legs, abdomen or back, which vary in size from one-fourth to several inches in diameter. The patient has intense itching and often feels quite weak.

Giant urticaria is a form of urticaria in which the wheals are very large.

Treatment: The condition may be prevented by determining the food to which the patient is sensitive and eliminating it from the diet. The injection of epinephrine or adrenalin usually clears the rash rapidly. Calomel, atropine and sodium bicarbonate are the usual remedies given. High colon irrigations are frequently advised.

ANGIONEUROTIC EDEMA

Angioneurotic edema is a condition characterized by temporary swelling of certain parts of the skin and mucous membranes.

Cause: The condition is sometimes caused by hypersensitiveness to various foods and it is often hereditary.

Symptoms: The characteristic symptom is sudden swelling or edema of various parts of the body which usually disappears in a day or two. The lips, the tongue, the hands and feet are usually affected. Occasionally sudden edema occurs in the stomach or intestines and causes abdominal pain and vomiting.

Treatment: If the attack is found to be due to certain foods by means of skin tests, or if it occurs after eating various foods, the condition may subside when these foods are eliminated from the diet.

Epinephrine, atropine and calomel and cold applications are the remedies used.

CHAPTER XVI

DISEASES DUE TO PHYSICAL AND CHEMICAL CAUSES

The following groups of diseases are caused by various physical or chemical agents.

DISEASES DUE TO PHYSICAL CAUSES

The diseases due to physical causes may be divided into two groups as follows:

1. Diseases Due to Temperature Changes.
2. Diseases Due to Atmospheric and Climatic Conditions.

DISEASES DUE TO TEMPERATURE CHANGES

HEAT STROKE OR SUN STROKE

Heat Stroke, Sun Stroke or Insulation is an acute condition caused by prolonged exposure to the heat of the sun. It occurs especially when the temperature is unusually high, for example above 90° F., in individuals whose occupations expose them to direct sunlight. Alcoholism, old age, and fatigue are predisposing causes.

Symptoms: The principal symptoms are headache, dizziness, weakness, nausea and vomiting. They may be followed by unconsciousness and coma and occasionally by twitchings of the muscles or convulsions. The temperature is usually very high, 107° to 110° F. or more. The pulse is very rapid, the breathing is rapid and deep, and the skin is flushed. After recovery many patients complain of severe headache for some time.

In severe cases the patient develops progressive collapse; the pulse becomes very rapid, the temperature persists and the patient may die.

Treatment: The disease is treated by cold baths, ice packs,

or rubbing the body with ice. Sometimes the patient is kept in a bath at a temperature of 65° or 70° F. for an hour or longer.

HEAT EXHAUSTION

Heat exhaustion is a condition which develops from prolonged exposure to excessive heat and humidity. It occurs among stokers or firemen on steamers or trains, especially in warm weather.

Symptoms: The principal symptoms are weakness, dizziness, nausea, and staggering. The patient becomes pale, the lips and face are blue, the skin is moist and cold, the temperature is subnormal, the pulse is rapid and weak, and the breathing is rapid and shallow. Sometimes severe painful cramps in the legs and abdomen, associated with weakness, develop instead of the collapse. In severe cases the patient may become unconscious and die.

Treatment: The condition is treated by rest in bed and stimulants such as whisky, atropine, caffeine, strychnine, etc.

DISEASES DUE TO ATMOSPHERIC CHANGES

CAISSON DISEASE

Caisson Disease or "Bends" is a disease which occurs among persons whose occupation necessitates working under increased atmospheric pressure such as divers, tunnel workers or workers in underground foundations. These men remain for hours in special compartments where the atmospheric pressure is greatly increased, sometimes to as much as 60 pounds to the square inch. The normal atmospheric pressure is 15 pounds to the square inch.

Cause: Divers and tunnel workers usually enter pressure chambers by stages. They first enter a compartment with slightly increased air pressure. From this chamber they pass gradually into others containing air under greater pressure, finally entering the compartment in which they work. They leave the pressure compartment by gradually passing from a room of higher pressure to one of lower pressure, finally coming out into the air.

Caisson disease is caused when workmen leave a pressure chamber suddenly or too quickly.

Symptoms: The symptoms of "bends" are headache, fainting,

nausea and vomiting. In severe cases the patient develops intense cramplike pains in the legs or abdomen. Sometimes paralysis of an arm or leg follows an attack.

Treatment: The disease may be prevented by leaving pressure chambers gradually. Before coming out into the open air the workmen should first pass from high to low pressure compartments.

The attack of "bends" is treated by replacing the patient at once in the compressed air chamber and applying hot applications to the extremities and giving morphine.

GAS POISONING

Gas Poisoning is a form of poisoning which results from inhaling various gases. It is commonly caused by carbon monoxide gas, carbon bisulphide gas, and the various gases used in warfare.

ILLUMINATING GAS POISONING

Carbon Monoxide or illuminating gas poisoning commonly occurs from inhaling illuminating gas or coal gas. This may happen accidentally from a leak in a gas pipe, from an attempt at suicide, or from burning coal in a stove with a defective draught. It often occurs among miners because natural gas is sometimes formed in coal mines. Carbon monoxide is the principal poisonous gas in illuminating or coal gas. It forms a compound with the hemoglobin of the blood (methemoglobin) which is unable to combine with oxygen.

Symptoms: The principal symptoms are headache, dizziness, nausea, vomiting and weakness. The breath has an odor of gas, the skin has a peculiar red color or it may be cyanotic, the breathing is rapid, deep and snoring in character, and the pulse is rapid and weak. In severe cases the patient gets drowsy and finally goes into coma.

Complications and Sequelæ: Bronchopneumonia and edema of the lungs are frequent complications and may cause death. Sometimes the patient recovers from the coma but is left with various disturbances of the nervous system such as headache, twitchings, disturbances in vision, neuritis, etc.

Chronic Gas Poisoning is a condition characterized by headache, dizziness, weakness and mental sluggishness. It results from living in a room or atmosphere which constantly contains minute quantities of illuminating or coal gas.

Treatment: The disease is treated by withdrawing about one or two pints of blood from an arm vein to remove some of the gas. This is followed by intravenous injections of normal salt solution or sodium bicarbonate and oxygen inhalations. Alpha lobeline, a respiratory stimulant, is sometimes given hypodermically.

GAS POISONING IN WARFARE

Various gases are used in warfare, especially chlorine gas, mustard gas and other gases. The principal symptoms are severe irritation of the bronchial tubes and lungs, causing cough and bloody expectoration. Soldiers who were gassed frequently suffer with a chronic cough and profuse expectoration for many years.

CLIMATIC DISEASES

MOUNTAIN SICKNESS

Mountain sickness is a disease which develops when going from a low to a high altitude as in mountain climbing or going up in an airplane. It occurs especially among those suffering from heart disease.

Symptoms: The symptoms are headache, ringing in the ears, nausea, weakness, sometimes faintness and cyanosis. The pulse may become slow and weak.

Treatment: A patient suffering with heart disease should avoid mountain climbing or ascending in airplanes. The symptoms disappear on descending to a lower altitude.

DISEASES DUE TO CHEMICAL CAUSES

There are certain diseases caused by various chemical substances. They may be contained in beverages, in food, in materials used in various industries, or in bacteria, or they may be drugs. Alcoholism is an example of poisoning by beverages. Food poisoning and Botulism are caused by eating decomposed food. Lead Poisoning occurs among painters and typesetters. The various infectious diseases already described are caused by poisons secreted by bacteria. The continued use of various drugs produces characteristic symptoms generally described as drug habit. The most common forms of poisoning by chemical substances are alcoholism and lead poisoning.

ALCOHOLISM

Alcoholism is a condition caused by the excessive use of alcoholic beverages. It may be caused by two kinds of alcohol: ethyl alcohol or grain alcohol, an ingredient of alcoholic beverages, and methyl alcohol, which is used in various industries. In discussing alcoholism we usually mean ethyl alcohol, unless another alcohol is specifically mentioned.

Alcoholism occurs in two forms:

1. Acute Alcoholism.
2. Chronic Alcoholism.

Acute Alcoholism

Acute alcoholism results from drinking excessive quantities of alcoholic drinks such as whisky, wine, beer and similar beverages.

Symptoms: The chief symptoms are uncontrolled talkativeness, coarse incoherent speech with repetition of words and obscure ideas, accompanied by gestures. The individual is excited, the gait becomes unsteady and he staggers. The face is flushed, the pulse is rapid and bounding. Sometimes nausea and vomiting follow. In severe cases the alcoholic bout is followed by stupor and coma.

Treatment: The condition is treated by washing out the stomach and moving the bowels thoroughly. When coma develops artificial respiration is performed and stimulants such as caffeine, strychnine, etc., are given.

Chronic Alcoholism

Chronic alcoholism is a disease characterized by the continual use of alcoholic beverages to excess. Excessive drinking occurs in two forms: periodic alcoholism and continuous alcoholism.

Periodic alcoholism is a condition characterized by drinking large quantities of alcoholic beverages at long or short intervals. The individual goes on a spree for days or weeks at a time.

Continuous alcoholism is a condition in which the patient takes excessive quantities of alcoholic beverages steadily.

Chronic alcoholism affects various organs and is a frequent cause of many diseases.

Symptoms

The chief symptom is an uncontrollable craving for alcoholic beverages. Sometimes the craving is so marked that alcoholic drinks such as whisky or gin are taken before breakfast.

The steady drinker usually has no appetite and sometimes tremor of the hands and lips. He is restless and suffers from sleeplessness.

The periodic drinker is perfectly normal except when he goes on a spree, and then he drinks large quantities of alcoholic drinks until he is thoroughly drunk.

The continuous use of alcohol predisposes to infections and other diseases, especially nervous and mental diseases.

When alcohol is taken for years it causes degenerative changes in various organs and tissues of the body which are described with the diseases of these organs. The most common diseases which may be caused by alcoholism are the following:

Chronic Gastritis, a chronic inflammation of the stomach.

Cirrhosis of the Liver, a chronic disease of the liver.

Alcoholic Multiple Neuritis, a disease of the nerves which causes paralysis of the flexor muscles of the arms and legs.

Chronic Nephritis and Arteriosclerosis are other diseases in which the continued use of alcohol is believed to be a causative factor.

Alcoholic Psychoses are common forms of mental disease due to alcoholism. They occur in two forms: Delirium Tremens and Korsakoff's Psychosis, but other forms of mental disease may also result from alcoholism.

Treatment: The prevention of alcoholism is largely a matter of education, inculcating temperate habits in children and setting a good example by parents. The alcoholic habit is usually treated in institutions which specialize in this disease. The treatment consists essentially of rest, physical exercise, proper feeding and the administration of atropine and strychnine.

WOOD ALCOHOL POISONING

Wood alcohol poisoning is a form of poisoning caused by wood alcohol or methyl alcohol. It results from drinking "bootleg alcoholic beverages" in which wood alcohol is often substituted for ordinary alcohol, or from adulterated Jamaica ginger. It occasionally develops from the continued application of hair tonics, witch hazel or similar preparations containing wood alcohol.

Symptoms: The symptoms occur in an acute or a chronic form.

The acute symptoms are similar to those of acute alcoholism.

The patient becomes excited, talkative and staggers. This is followed by nausea, vomiting and delirium. When very large quantities are taken stupor and coma develop and the patient dies within a few hours. In many cases when the acute symptoms subside permanent blindness results, from destruction of the optic nerve.

Chronic wood alcoholism may produce blindness. It often results from the continued use of preparations containing wood alcohol.

Treatment: The acute stage of the disease is treated by washing out the stomach, by colon irrigations, by artificial respiration and administering stimulants, such as caffeine, strychnine, etc. The blindness is usually not amenable to treatment.

LEAD POISONING

Lead poisoning or Plumbism is a chronic disease caused by lead. It occurs especially in painters, plumbers, typesetters or workers in paint factories.

Symptoms

The chief symptoms are a blue or lead line on the gums, abdominal cramps lasting for days, constipation, and anemia.

Lead Neuritis sometimes develops which causes paralysis of the muscles of the arms and legs, causing "drop hands" and "drop feet."

Lead Encephalopathy is a rare condition which results from the effect of lead on the brain. It is characterized by headache, dizziness, sleeplessness and delirium.

Chronic lead poisoning is sometimes a causative factor in arteriosclerosis and chronic nephritis.

Treatment: There are various methods used to prevent the occurrence of lead poisoning among painters, plumbers, typesetters or workers in paint factories. They consist essentially of proper ventilation to remove the lead fumes, wearing suitable masks, and scrubbing the hands thoroughly before meals.

When symptoms develop, the patient is confined to bed, Epsom salt is given to move the bowels, and warm applications are applied to the abdomen, or morphine is administered for the colic. Potassium iodide is given to eliminate the lead. The anemia is treated by iron and similar tonics. The paralysis is treated by massage, electricity, strychnine, etc.

PHOSPHORUS POISONING

Phosphorus poisoning is a form of chronic poisoning which occurs especially among workers in phosphorus match factories.

Symptoms: The principal symptoms are a taste of phosphorus in the mouth and a chronic destructive process in one of the jaw bones, sometimes associated with jaundice and anemia.

Treatment: The condition may be prevented by adequate ventilation in match factories to remove the fumes, and the inhalation of crude turpentine. The abscesses and destructive process of the jaws are treated surgically.

OTHER FORMS OF POISONING

Chronic Mercury Poisoning, Arsenic Poisoning and Drug Habits are uncommon forms of poisoning. They are discussed in books on Materia Medica.

FOOD POISONING

Food Poisoning is a condition caused by eating decomposed food. It is sometimes called ptomaine poisoning because it was thought to be due to ptomaines, a form of poison produced when protein foods decompose. Food is usually decomposed by the action of various bacteria, and food poisoning usually causes acute gastritis or acute enteritis. Botulism is a common form of food poisoning caused by the Bacillus Botulinus.

Symptoms

The symptoms are abdominal pain, nausea, vomiting and diarrhea, associated with collapse, a rapid pulse and weakness. They usually result from severe irritation of the gastrointestinal tract.

Treatment: The disease is treated in the same manner as acute gastritis (see page 299).

AUTOINTOXICATION

Autointoxication is a group of symptoms produced by absorption of poisons formed by the decomposition of food and residue in the large intestine. The putrefaction is caused by various bacteria.

Symptoms: The symptoms are headache, dizziness, lack of energy, distention with gas, and constipation or diarrhea.

Treatment: The disease is treated by a suitable diet to prevent putrefaction, by laxatives, cathartics and intestinal antiseptics, and by colon irrigations.

Fermented milk, such as Bacillus Acidophilus or Bacillus Bulgaricus milk, is commonly given because the lactic acid forming germs which they contain checks intestinal putrefaction.

PART II: DISEASES OF ORGANS AND SYSTEMS

CHAPTER XVII

DISEASES OF THE NOSE, THROAT AND LARYNX

Physiology of the Nose and Throat

The nasal cavities are passages in the nose through which the air passes before entering the bronchial tubes and the lungs. The function of the nasal cavities is to warm the inspired air and to remove particles of dust and foreign substances from it.

The Sinuses: The sinuses are cavities situated in some of the bones of the face and skull. There are four sets of sinuses: a large sinus in each superior maxillary bone, a group of small cavities in the ethmoid bones, several small cavities in the frontal bones, and one in the sphenoid bone. They all open into the nasal cavities underneath the turbinate bones, where their secretions are discharged.

DISEASES OF THE NASAL CAVITIES

The diseases of the nasal cavities are principally deviations of the septum, enlarged turbinate bones and infections within the nasal cavities and sinuses. They belong to the specialty of nose and throat diseases and will therefore not be discussed in detail. We shall only describe briefly the more common diseases.

EPISTAXIS OR NOSEBLEED

Epistaxis or nosebleed may occur from injury or ulceration in the nose and is frequently a symptom of various diseases. It is a common prodromal symptom of typhoid fever. It frequently occurs in old people as the result of arteriosclerosis and in various diseases of the blood such as anemia, leukemia, purpura, etc.

Symptoms: The bleeding may be only a discharge of bright red blood from the nose, or large clots may be passed. Sometimes the blood is discharged into the throat from the back of the nose. The blood usually comes from a small spot on the

front part of the septum of the nose called Hasselbach's area, but other areas in the nasal cavities may also be the source of bleeding. If the bleeding is profuse the patient becomes pale, and the pulse becomes rapid and weak, and all the general symptoms of hemorrhage develop.

Treatment: A mild nosebleed usually stops spontaneously. If the bleeding persists the application of an ice bag to the nose, or the elevation of the head will relieve it. When the physician arrives he usually packs the nose with gauze or applies astringent substances or cauterizes the bleeding spot.

ACUTE RHINITIS

Acute Rhinitis is an acute infection of the mucous membrane of the nose. This is the manner in which the common cold or cold in the head frequently begins.

Cause: The disease is caused by various germs which enter the nose with the inspired air, such as the streptococcus, staphylococcus, influenza bacillus, etc. A sudden change in temperature or exposure to wet and cold is a predisposing factor. Acute rhinitis is frequently ap rodromal symptom of measles or other infections.

Symptoms: The symptoms are a slight rise in temperature, a feeling of illness, continual sneezing and a discharge from the nose. At first the discharge consists only of mucus, but it changes rapidly to a mixture of mucus and pus.

Complications: The infection may extend to the throat, producing a tonsillitis, or to the larynx, producing an acute laryngitis. The most common complication, however, is infection of the sinuses. The patient then complains of severe pain over the forehead, pain in the cheeks and the teeth and has a continual discharge of pus from the nose.

Treatment

Prevention: Acute rhinitis is usually a mild disease, but its complications are often serious. Exposure to wet and cold should be avoided.

Recurrent colds are sometimes prevented by removing infected tonsils or treating chronic sinus disease. These conditions may be the source from which repeated infections originate. Injections of bacterial vaccines are sometimes used as a preventive measure. Sneezing, coughing, and the use of the same dishes

and towels probably spreads the infection. The patient should therefore be instructed in proper personal hygiene to avoid spreading the infection.

Symptomatic Treatment: In the early stage a cold may sometimes be aborted by taking a brisk cathartic and by various measures which produce sweating; such as hot lemonade, hot drinks, or Dover's powder.

When the cold has developed, the nose is often irrigated with normal salt solution or sprayed with adrenalin, menthol, albolene, and similar preparations.

The pain, the slight temperature, and the usual feeling of illness, are treated by coal-tar remedies such as aspirin, phenacetin, acetanilid, salicylic acid, bicarbonate of soda, and similar remedies. Atropin is often given to check the profuse secretion from the nose.

CHRONIC RHINITIS

Chronic Rhinitis is a chronic inflammation of the mucous membrane of the nasal cavities.

Cause: The disease is usually associated with chronic inflammation of the sinuses. It sometimes follows repeated attacks of acute rhinitis. Enlargement and thickening of the turbinate bones or deformities of the septum are frequent predisposing causes.

Symptoms: The chief symptom is a chronic mucoid or purulent discharge from the nose.

Atrophic Rhinitis or Ozena is a form of chronic rhinitis in which the mucous membrane of the nose becomes thin and dry, and foul-smelling crusts constantly form in the nose.

Treatment: The original cause, such as chronic sinus infections, obstructions in the nose, etc., are usually treated. In addition, various antiseptic solutions are applied in the nasal cavities by means of irrigations, sprays or local applications.

SINUS INFECTIONS

Sinus infections are acute or chronic infections within the sinuses of the bones of the face and skull. The disease may affect one or several cavities or all the sinuses. It occurs in two forms: acute sinusitis and chronic sinusitis.

Acute Sinusitis

Acute sinusitis is usually associated with an acute rhinitis and results when the infection extends from the nasal cavities into some of the sinuses.

Symptoms: The symptoms are pain in the head, in the teeth, in the cheeks or above the eyes, and a profuse discharge of pus from the nose and back of the throat. Sometimes sinus infections are very severe and cause very high septic temperature.

Treatment: The mild cases are treated in the same manner as acute rhinitis. Hot applications are applied on the face. The nasal cavities are sprayed with various antiseptic solutions, and adrenalin, or are irrigated with warm saline solutions. In severe cases the sinuses may have to be opened and drained through the nose.

Chronic Sinusitis

Chronic sinusitis is a chronic infection of the sinuses in the head which may affect one or several sinuses. The disease usually follows repeated attacks of acute infections, especially when there are mechanical obstructions in the nasal cavities. It may also follow repeated infections of the tonsils and adenoids.

Symptoms: The chief symptom is a chronic discharge of mucus or pus from the nose or throat. This is often associated with headache, pains in the head or face, or about the eyes. When the frontal or maxillary sinuses are affected the patient has a continuous discharge from the nose. When the ethmoid or sphenoid sinuses are involved the discharge is usually in the back of the throat.

Treatment: The disease is treated by irrigations, or nasal sprays with various antiseptic solutions. Sometimes, however, it is necessary for the physician to puncture the sinuses and drain the pus, or wash them out repeatedly with various antiseptic solutions such as argyrol, lunosol and similar substances.

HAY FEVER

Hay fever, pollinosis or allergic coryza is a disease characterized by periodic attacks of sneezing and congestion of the mucous membrane of the eye. The disease is caused chiefly by the pollens of various plants; such as goldenrod, ragweed, timothy, and other grasses, and occurs only in susceptible individuals. It is described under allergic diseases (see page 158).

DISEASES OF THE THROAT

The Tonsils and Adenoids

The tonsils are two almond-shaped lymphatic structures situated in the throat, one on either side. The function of the tonsils is not definitely known, but they probably act as filters for infection. They are relatively larger in children than in adults and they become smaller with advancing years.

The adenoids are a small mass of lymphatic tissue situated in the back of the nose. They probably act as filters for the bacteria which pass through the nose with the inspired air.

The diseases of the tonsils occur principally as acute or chronic inflammations. **Acute Follicular Tonsillitis** is the most common disease of the tonsils. It is a specific infectious disease which has already been described (see page 85).

PHARYNGITIS

Pharyngitis is an acute or chronic inflammation of the mucous membrane of the pharynx.

Acute pharyngitis is usually part of a cold or an acute tonsillitis. The pharynx becomes red and inflamed. The patient complains of a raw sensation in the throat, and pain, especially on swallowing.

Chronic pharyngitis may result from repeated attacks of acute pharyngitis, or from infected tonsils and adenoids, or from the continual discharge in chronic sinus infections. The patient complains of a constant irritation in the back of the throat. The pharynx is red, the mucous membrane is thickened and contains numerous dilated capillaries.

Treatment: The treatment consists of treating the cause, which may be infected tonsils, adenoids, or sinus infections. Some physicians order various astringent gargles or paint the throat with various solutions such as argyrol, silver nitrate and similar substances.

CHRONIC TONSILLITIS

Chronic tonsillitis is a chronic inflammation of the tonsils. It is caused by repeated attacks of acute tonsillitis or peritonsillar abscess (quinsy sore throat).

Symptoms: The principal symptoms are a continual irritation in the throat and frequent attacks of sore throat. The tonsils may be enlarged or firmly imbedded and adherent to the sur-

rounding structures. They frequently contain small abscesses which constantly secrete pus.

Chronic tonsillitis may be a focus of infection from which pus or poisons may be absorbed continually. This may produce chronic arthritis, nephritis, heart disease and other conditions.

Treatment: Infected tonsils are usually removed by a surgical operation.

HYPERTROPHIED TONSILS

Hypertrophied tonsils are enlarged tonsils.

Cause: Some children are born with enlarged tonsils. During childhood the tonsils are usually more or less enlarged. In adults large tonsils may result from repeated attacks of tonsillitis.

Symptoms: In many children enlarged tonsils persist for many years withous causing symptoms. They become inflamed very readily, however, and predispose to ear infections. Sometimes they are so large that they cause difficulty in breathing.

Enlarged tonsils are removed when they cause symptoms.

ADENOIDS

Adenoids are enlarged or inflamed lymphoid or adenoid tissue in the back of the throat and nose.

Cause: The adenoids are enlarged from birth in many children. As a rule, however, they become enlarged or infected as the result of continued infections in the nose and throat. They are usually associated with enlarged or inflamed tonsils.

Symptoms: When the adenoids are large the child breathes with the mouth open because of the obstruction in the back of the throat. The presence of adenoids tends to keep up nasal infections or colds for a long time. There is usually a continual discharge in the back of the nose and throat.

Sometimes development is retarded and the child has a dull stupid expression.

Adenoids are usually removed when they cause symptoms.

UNCOMMON THROAT INFECTIONS

VINCENT'S ANGINA

Vincent's Angina is an acute infection of the throat caused by the Spirillum of Vincent and the Bacillus Fusiformis.

Symptoms: The principal symptoms are a characteristic grayish yellow membrane, ulcers in the throat and mouth, and

swollen lymph glands in the neck. The membrane is somewhat similar to that of diphtheria or syphilis. There is usually a slight fever, about 99° or 100° F., but usually without toxic symptoms.

Treatment: The disease is treated by local applications of tincture of iodine or silver nitrate. Arsenic preparations such as Fowler's Solution are given by mouth, and sometimes salvarsan or arsphenamine is injected intramuscularly, or into the veins.

LUDWIG'S ANGINA

Ludwig's Angina is a severe infection of the mouth and throat characterized by gangrene and septicemia. The disease usually results when a severe streptococcus infection of the mouth involves the submaxillary gland and then extends to the structures at the floor of the mouth. It sometimes occurs as a complication in scarlet fever, diphtheria, typhoid fever or other diseases.

Symptoms: The patient complains of pain in the mouth and throat, especially on swallowing. The floor of the mouth and the throat become markedly swollen and inflamed and an extensive abscess develops rapidly. The submaxillary lymph glands are markedly swollen and tender. The patient runs a severe septic temperature and may die within twenty-four to forty-eight hours. Edema of the glottis or gangrenous areas in the mouth or throat are common complications.

Treatment: The disease is treated by antiseptic mouth washes and extensive incision of the abscess and the inflamed areas.

RETROPHARYNGEAL ABSCESS

Retropharyngeal abscess is an acute or chronic severe inflammation of the tissues and lymph nodes in the back of the throat which usually results in extensive abscess formation. The chronic form is usually due to tuberculosis. The disease occurs especially in children.

Symptoms: The principal symptoms are difficulty in swallowing and sometimes in breathing, a marked swelling in the back of the pharynx, and slight fever. Sometimes edema or swelling of the tissues in the throat or glottis, or bronchopneumonia, develop as complications.

Treatment: The condition is treated by an incision and drainage.

DISEASES OF THE LARYNX

ACUTE LARYNGITIS

Acute laryngitis is an acute inflammation of the larynx. It usually results from a cold or follows acute rhinitis, or acute tonsillitis, especially in persons who use their voices a good deal, such as singers, teachers, or lecturers.

Symptoms: The symptoms are hoarseness, a dry cough, and pain in the throat.

Treatment: The disease is treated by inhalations of steam, to which tincture of benzoin, oil of pine needles, or other medicinal substances are added. Some physicians order an ice bag applied to the neck.

CHRONIC LARYNGITIS

Chronic laryngitis is a chronic inflammation of the larynx. It frequently occurs among those who are subject to repeated attacks of acute laryngitis or who have chronic tonsillitis or a discharge in the back of the throat from chronic sinus disease.

Symptoms: The principal symptoms are hoarseness and pain, especially on speaking or singing.

Treatment: The disease is treated by removing the cause, such as infected tonsils, or treating the sinus disease. The patient is usually advised to rest the voice. The physician frequently applies various local remedies or sprays to the larynx.

SYPHILIS OF THE LARYNX

Syphilis of the larynx is a syphilitic infection of the larynx which usually occurs in the third stage of the disease. It is characterized by ulceration of the vocal cords or other regions of the larynx.

Symptoms: The symptoms are hoarseness, pain on swallowing, and other evidence of syphilis. The Wassermann test is usually positive.

Treatment: The usual antisyphilitic remedies such as salvarsan, mercury, iodides, etc., are given as specifics. To relieve the pain and other local symptoms, the patient is advised to rest the voice, and steam inhalations are ordered. Various astringents are applied to the larynx by the physician.

TUBERCULOSIS OF THE LARYNX

Tuberculosis of the larynx is a fatal disease which usually

occurs as a terminal form of chronic tuberculosis. The disease is characterized by tuberculous thickening and ulceration of the larynx, involving the vocal cords and the cartilaginous structures of the larynx.

Symptoms: The principal symptoms are intense pain on swallowing, marked hoarseness and sometimes difficulty in breathing, associated with loss of weight, emaciation and all the symptoms of severe chronic tuberculosis. The patient usually dies within a year after the larynx becomes involved.

Treatment: The physician applies various local remedies or orders various sprays to relieve the pain. At the same time the general treatment of tuberculosis is carried out.

LARYNGEAL PARALYSIS

Laryngeal paralysis is a paralysis of the vocal cords. The condition usually results when an aneurysm of the aorta or a tumor in the chest presses upon one of the nerves carrying impulses to the vocal cords. It is sometimes produced by injury of some of the nerves of the larynx during a goiter operation.

The symptoms are hoarseness and a characteristic dry "brassy" cough.

Treatment: When the condition is caused by an aneurysm of the aorta, antisyphilitic remedies such as salvarsan, mercury and iodides are usually given. When it results from an operation it improves spontaneously unless the injury has severed the nerve completely.

SPASMODIC CROUP

Spasmodic croup is a condition occurring in children characterized by a sudden spasmodic croupy cough.

Cause: It may be produced by any disease of the upper respiratory tract such as acute or chronic sinus disease, acute laryngitis, bronchitis, or enlargement of the thymus gland. Similar attacks occur in diphtheria of the larynx.

Symptoms: The child suddenly develops a croupy cough during the night. The voice is hoarse, and the breathing becomes difficult or asthmatic.

Treatment: The original cause, such as sinus disease, bronchitis, etc., is usually treated to prevent the attacks. When an enlarged thymus is the cause, X-ray treatment of the thymus is sometimes beneficial. The attacks are usually treated with preparations of ipecac, various sedatives, atropine and cough mixtures.

LARYNGISMUS STRIDULUS

Laryngismus stridulus is a spasm of the larnyx which occurs in nervous children or those suffering from rickets and other disturbances of nutrition.

Symptoms: The principal symptoms are characteristic attacks occurring especially at night. The child suddenly becomes unable to catch its breath, gets blue, and seems to asphyxiate, when suddenly he takes a peculiar deep, crowing breath, and the attack is over.

Treatment: The condition is treated by a diet containing plenty of nutritious food, fat and water soluble vitamines, mineral salts, especially calcium. During the attack the inhalation of steam or warm applications to the larynx may give relief.

EDEMA OF THE GLOTTIS OR LARYNX

Edema of the Glottis or Larynx is a swelling of the tissues around the larynx due to infiltration with serum. It is a serious condition because the swelling is sometimes so marked that it obstructs the opening of the larynx and the patient may choke to death.

Cause: The condition is apt to develop in old people, especially when they suffer from chronic decompensation of the heart or nephritis. It sometimes occurs in the course of diphtheria, meningitis, scarlet fever, tuberculosis and various throat infections.

Symptoms: The chief symptom is an attack of severe shortness of breath and cyanosis, which gets rapidly worse. The patient is unable to breathe without holding on to the chair or bed. If the attack is not relieved he may choke to death.

Treatment: Whenever symptoms suggesting the condition develop, the physician should be notified at once. An ice bag should be applied to the larynx and the patient given pieces of ice to swallow until the physician arrives. The physician sprays the larynx with adrenalin, applies astringent solutions to the throat or incises the swollen tissues.

HYSTERICAL APHONIA

Hysterical aphonia is a sudden loss of voice which sometimes occurs in hysterical women. The patient becomes very hoarse and may be unable to speak for weeks. It usually subsides when the hysterical attack is over. It is sometimes relieved by electrical treatment of the larynx or by psychical methods.

CHAPTER XVIII

DISEASES OF THE LUNGS

Physiology of the Lungs

The lungs are two spongy elastic structures situated in the chest. They are composed of numerous microscopic air sacs between which are tiny capillaries. The function of the lungs is to obtain oxygen from the air and to eliminate carbon dioxide; one of the waste products of the body. This is accomplished by the process of respiration, consisting of inspiration and expiration. During inspiration air is taken into the lungs while during expiration air is expelled from the lungs. It is beyond the scope of this book to discuss the mechanism in detail.

The trachea and bronchi are a series of cartilaginous tubes which enter the lungs and by numerous subdivisions reach every part of the lungs. The function of the bronchial tubes is to bring air to the air sacs and form a passage through which the carbon dioxide and other waste products are eliminated.

Symptoms of Diseases of the Lungs

Diseases of the lungs produce local and general symptoms.

Local Symptoms

The local symptoms may be divided into two groups:

1. Efforts to Eliminate Irritants.
2. Disturbances in Respiration.

Efforts to Eliminate Irritants

The most common local symptoms of diseases of the bronchi and lungs are cough and expectoration. These symptoms are attempts to eliminate irritants or infectious material from the lungs.

Cough: Cough is a violent expiration which expels irritant or infectious substances from the lungs or bronchial tubes. The irritant may be mucus, pus, or an object which has accidentally

entered the bronchial tubes. Sometimes cough is produced when the nerves which directly or indirectly affect the mechanism of coughing are irritated.

A cough may be accompanied by expectoration or it may be dry or spasmodic.

The cough produced by accumulation of secretion in the bronchi or lungs is usually accompanied by expectoration.

A dry cough is a cough without expectoration. It is usually due to irritation in the pleura or congestion in the lungs or bronchi, or irritation of the nerves in the lungs.

A spasmodic cough is a cough which consists of a series of violent expiratory efforts. In certain diseases the cough is characteristic. In whooping cough, for instance, the patient has a paroxysm of coughing. It occurs in spasms which end in a prolonged inspiration or whoop. In laryngismus stridulus the cough ends with a peculiar crow.

Expectoration: Expectoration is the act of expelling the contents of the bronchial tubes or of some of the air sacs in the lungs. It results when sufficient secretion accumulates in the bronchial tubes or lungs.

Sputum: The sputum is the expectorated secretion from the lungs or bronchial tubes. The character, quantity and appearance of the sputum as well as the frequency of expectoration is often characteristic in certain diseases. Lung abscess or bronchiectasis, for instance, is characterized by periodic expectoration of large quantities of sputum. In nursing these diseases the nurse should collect the sputum in a large measuring glass, which should be kept covered to avoid spreading the infectious material. The reduction in the quantity of sputum usually indicates improvement.

In some diseases the sputum contains abnormal constituents, which are usually mucus, pus, blood or various specific bacteria.

The sputum which contains pus is yellow or green in color. Blood gives the sputum a red frothy appearance. When it is only tinged with blood the sputum has a rusty appearance and is called "rusty sputum." The presence of specific bacteria such as tubercle bacilli or various types of pneumococci in the sputum is determined by special microscopic or bacteriologic examinations. When a specimen of sputum is sent to the laboratory to be examined for tubercle bacilli a sufficient quantity should be collected in suitably covered receptacles. When it is sent for examination for pneumococci it must be collected in sterile containers.

Disturbances in Respiration

Disturbances in respiration manifest themselves as a change in rate or in the type of breathing.

Changes in Rate: The rate of respiration may be too rapid or too slow. The rate is usually increased in fevers, but it is more rapid in those fevers caused by pulmonary disease. It is sometimes increased in nervous people or in patients suffering with exophthalmic goiter or hyperthyroidism.

Apnea: This is a type of slow shallow breathing. The respiration usually becomes slow in morphine poisoning and in certain diseases of the nervous system.

Dyspnea: This is a type of rapid, labored breathing. **Orthopnea** is a condition in which the patient can breathe only when he sits up. He often holds on to the bed or some object and the chest expands visibly during respiration.

Dyspnea and orthopnea are usually accompanied by cyanosis because even in spite of the difficult, labored breathing the patient is unable to obtain sufficient oxygen for the hemoglobin of the blood. They occur in heart disease or diseases in the chest which obstruct the larynx, trachea or bronchi.

Cheyne Stokes Breathing: This is a type of abnormal respiration which consists of short periods of apnea, alternating with short periods of rapid dyspneic breathing. During the period of apnea the breathing becomes slower and shallower until it apparently stops entirely. The breathing now steadily gets deeper and more rapid until it becomes dyspneic. Then it steadily gets slower and shallow again. This alternating slow and rapid respiration may continue for hours and days. Cheyne Stokes breathing occurs in severe diseases of the lungs, heart or brain and as a terminal condition in many infections.

Cyanosis: This is a blue color of the skin, which is produced whenever the patient has difficulty in obtaining a sufficient amount of air to oxygenate the blood. It usually occurs in disease of the heart, lungs or diseases which produce obstruction in the larynx or bronchi. It is sometimes produced by poisons such as illuminating gas or coal-tar substances, like acetanilid, phenacetin, etc. These substances combine with the hemoglobin of the blood and prevent it from obtaining oxygen.

General Symptoms

The general symptoms of diseases of the lungs result from the

disturbed respiration and from the specific cause of the disease. They are principally fever, rapid pulse, loss in weight, etc.

Symptoms to be Observed in Nursing Pulmonary Diseases

When nursing diseases of the lungs the nurse should observe and record the following symptoms:

1. The respiration; the rate, depth and type.
2. Pain; the character and location and whether it is made worse by breathing or coughing.
3. Cough; the frequency and character; whether it is spasmodic, dry or accompanied by expectoration.
4. Sputum; the quantity, color, and its appearance should be noted; whether it contains blood, pus, mucus or other substances.
5. Dyspnea; whether it is inspiratory or occurs in attacks.
6. Orthopnea; the position in which breathing is comfortable.
7. Cyanosis; whether it occurs on the face, neck, hands, extremities or over the entire body.

Pulmonary Physical Signs

Physical signs of the lungs are certain objective signs indicating disease of the lungs which the physician obtains when he examines the patient. The methods used are inspection, palpation, percussion and auscultation. It is beyond the scope of this book to discuss these methods in detail.

Inspection or observation of the chest enables the physician to note changes in respiration, enlargement of the chest, or the type of breathing.

Palpation or feeling the chest is a method of examination by which the physician determines the consistency of the chest wall and recognizes certain structural changes in the lungs by means of impulses produced by breathing.

Percussion or tapping the chest with the fingers is a method of examination whereby a change in the consistency of the lung or the presence of air or fluid in the chest is determined. The normal lung produces a characteristic sound when tapped. When a disease changes the structural character of the lung or fills the chest with fluid or air, the sounds produced on percussing the chest are changed.

Auscultation is a method of listening to the chest, with a stethoscope or the ear, to determine changes in the sounds produced when air enters or leaves the bronchi or lungs during respiration.

When the lung is diseased or when fluid or air is present in the chest cavity, the character of the sounds produced by breathing is changed, or abnormal sounds develop. Râles are fine bubbling or crackling sounds which the physician hears in various diseases of the lung or pleura.

DISEASES OF THE BRONCHI

ACUTE BRONCHITIS

Acute bronchitis is an acute inflammation of the bronchial tubes.

Cause: The disease is usually caused by various bacteria such as the streptococci, staphylococci, pneumococci, the influenza bacilli and similar germs. It may develop when an acute infection of the nose or throat or when an attack of grippe extends into the bronchial tubes. It also occurs as a prodromal symptom in measles or typhoid fever. Exposure to wet and cold is the most common predisposing factor.

Pathology: The disease process begins as congestion of the bronchial tubes, and is followed by an inflammation with excessive secretion of mucus.

Symptoms

The symptoms may be divided into two stages:

1. The stage of congestion.
2. The stage of expectoration.

The stage of congestion lasts a day or two. The chief symptoms are pain over the sternum or front of the chest on one or both sides and a tight sensation in the chest, associated with a dry cough.

The chief symptoms in the stage of expectoration are frequent coughing and profuse expectoration. At first the sputum consists only of mucus, but later the mucus becomes mixed with pus. In severe cases there is a slight rise in temperature, ranging from 100° to 101° F.

Bronchitis usually subsides within a week or two, but the cough often persists for some time.

Complications: When the bronchitis extends to the finer bronchioles, pus and mucus accumulate in some of the air sacs and bronchopneumonia may develop. This may occur especially in children and old people.

Treatment

Prevention: Persons who are subject to frequent attacks of acute bronchitis should avoid exposure to wet and cold. If possible they should pass rigorous winters in warm Southern climates. A patient with an attack of grippe or acute rhinitis should be advised to rest in bed to prevent extension of the infection to the bronchi.

Symptomatic Treatment: During the stage of congestion mustard plasters, mustard paste or various capsicum salves are applied on the chest. Rubbing the chest with turpentine or camphor oil or cupping are other methods used. These remedies produce redness of the chest, which brings the blood to the surface and relieves the congestion. The room should be kept warm and the patient should stay in bed. Some physicians prescribe various cough mixtures containing syrup of ipecac, codeine or similar remedies. Sometimes aspirin, phenacetin, or other coal-tar substances are given for the relief of the pain in the chest and fever. Steam inhalations with benzoin are sometimes ordered.

The stage of expectoration is usually treated by various cough mixtures. The solution of ammonia and anise or ammonium chloride are given to increase the expulsion of mucus. When the cough is spasmodic, terpin hydrate is used. If expectoration is purulent or if the cough is spasmodic, creosote is given by mouth, or the inhalations of steam with tincture of benzoin or oil of pine needles are often ordered. If the cough is excessive and annoying to the patient, codein, heroin, or other preparations of opium are ordered.

CHRONIC BRONCHITIS

Chronic bronchitis is a chronic inflammation of the bronchial tubes. It occurs especially in old people and in patients with emphysema, chronic heart disease, chronic nephritis or arteriosclerosis. It may follow repeated attacks of acute bronchitis, influenza or bronchopneumonia.

Pathology: The bronchial tubes gradually become thickened by the formation of connective tissue in their walls. There is excessive secretion of mucus from their mucous membrane. Some of the tubes may become dilated, forming a condition called bronchiectasis.

Symptoms

The symptoms of chronic bronchitis are a chronic cough and

expectoration, especially during the winter, or in moist, changeable climates. The expectoration may be slight, and only occur in the morning. Some patients, however, expectorate large quantities of mucus and purulent material.

Fibrinous bronchitis is a form of chronic bronchitis in which patients expectorate large quantities of fibrin.

Treatment: The disease is treated by a change of climate, by measures to relieve the various predisposing chronic diseases, and by various cough remedies. Patients with chronic bronchitis are usually advised to live or spend their winters in a dry, warm climate. The remedies commonly used are potassium iodide in large doses, or various cough mixtures. Some physicians order steam inhalations containing tincture of benzoin, oil of pine needles and similar remedies. Guiacol, creosote and similar preparations are frequently given by mouth. They are excreted by the lungs and act as antiseptics in the bronchial tubes.

BRONCHIECTASIS

Bronchiectasis is a condition characterized by widening and dilatation of some of the bronchial tubes.

Cause: The disease usually develops in chronic bronchitis, in the course of chronic fibroid tuberculosis or in chronic lung abscess.

Pathology: The accumulation of large quantities of mucus and pus within the bronchial tubes gradually dilates their walls, forming a sac in the wall of a bronchus, or the entire bronchus may be stretched to form a cavity.

Symptoms: The symptoms are similar to those of lung abscess. The patient has a chronic cough and expectorates large quantities of foul-smelling, purulent material. When most of the pus in the dilated bronchus is expectorated, the patient usually feels better and the cough and expectoration subside.

Treatment: The disease is treated medically or locally through a bronchoscope.

The medical treatment consists of inhalations of steam containing various antiseptic substances such as tincture of benzoin, oil of pine needles and similar substances. The remedies ordered by mouth are guiacol, creosote or potassium iodide. A mountainous, dry climate is sometimes beneficial.

Bronchoscopic Treatment: This is a recent method of treatment and is often quite beneficial. A bronchoscope is passed into the large dilated bronchus, the pus is washed out, and argyrol,

lipoiodine, bismuth and other antiseptic substances are injected into the affected bronchus.

DISEASES OF THE LUNGS

PNEUMONIA

Pneumonia is one of the most common diseases of the lungs. It is an acute infectious disease and is therefore discussed with the infectious diseases (see page 95).

PULMONARY TUBERCULOSIS

Pulmonary tuberculosis is one of the most common infectious diseases of the lungs. It is described with the infectious diseases (see page 110).

ASTHMA

Asthma is a disease characterized by sudden periodic attacks of shortness of breath, wheezing and cyanosis. It is usually caused by animal hair emanations. It may also occur in heart disease or other diseases in the chest. It is described with allergic disases (see page 161).

EMPHYSEMA

Emphysema is a disease of the lungs in which the air sacs become enlarged and distended. It is usually associated with chronic bronchitis.

Cause: The disease occurs especially in persons whose occupation requires excessive expansion of the lungs, such as glass-blowers or musicians who play large wind instruments, and among those who do unusually hard muscular work. It is also a common condition in old people, one of the manifestations of the usual changes of old age.

Pathology: The structural changes of the disease are a gradual formation of connective tissue between the air sacs. As a result, the lungs lose their elasticity and become distended.

Symptoms

The principal symptoms are a chronic cough with expectoration, due to the chronic bronchitis, and attacks of shortness of

breath. Sometimes the patient has typical attacks of asthma, associated with cyanosis. The patient is frequently somewhat cyanotic, even when he has no shortness of breath, and the chest is barrel shaped. In long-standing cases the fingers become clubbed and blue. The physician obtains a drumlike sound when he examines the patient's chest as well as a change in the type of breathing.

Treatment: The remedies usually ordered for emphysema are potassium iodide in large doses and various cough mixtures for the chronic bronchitis. The predisposing causes, such as chronic heart disease or arteriosclerosis, are also treated. Sometimes a change in climate is advised and the patient is often benefited by moving from a cold moist to a warm dry climate.

LUNG ABSCESS

Lung abscess is an infection of the lung characterized by the formation of a small or large abscess cavity in the lung.

Cause: The disease may occur as a complication of bronchopneumonia or lobar pneumonia. It may develop when some foreign substance such as the kernel of a nut or any object is accidentally aspirated into the lung. It sometimes follows operations for the removal of the tonsils and adenoids, when blood, pus, or infected material is aspirated into the lung during the operation.

Pathology: The abscess in the lung may be small or large and usually opens into a bronchus. There may be one single abscess or several small ones communicating with one another. When a lung abscess exists for some time, a good deal of scar tissue forms around it as well as in the bronchus into which it opens. The accumulation of pus in the bronchus gradually stretches its walls, producing a condition known as bronchiectasis, which is frequently associated with lung abscess.

Symptoms

The symptoms are attacks of coughing and expectoration, accompanied by a rise in temperature which may last days or weeks. The expectoration is very profuse and consists of large quantities of foul-smelling pus. Sometimes as much as a pint or more of sputum may be expectorated during the day. When the abscess cavity is completely empty of its pus the cough and expectoration and the temperature subside. In a few days, however, pus accumulates again in the abscess cavity. The tem-

perature then rises again, the patient again has pain in the chest and another attack of coughing, with expectoration of large quantities of foul-smelling pus.

When the patient is examined, the physician may find evidence, by physical signs, of cavity formation or a solid area within the lung. The X-ray examination of the chest will show the abscess cavity. Sometimes the size and shape of the cavity may be demonstrated by injecting various solutions such as bismuth or lipoiodine into the abscess cavity, through a bronchoscope, and then taking an X-ray picture of the chest.

Treatment

The methods of treatment are the following:

1. Prevention.
2. Medical Treatment.
3. Bronchoscopic Treatment.
4. Surgical Treatment.

Prevention: The formation of a lung abscess after tonsil and adenoid operations may be prevented by methods which prevent aspiration of blood and pus into the lungs during the operation, especially when it is performed under an anesthetic. When a foreign body is aspirated into the lungs, the formation of a lung abscess may be prevented if it is removed as soon as possible through a bronchoscope.

Medical Treatment: Medical treatment is usually only palliative. The remedies usually ordered are inhalations of steam with various antiseptic solutions such as oil of pine, benzoin, and similar substances, or various pulmonary antiseptics such as creosote, guiacol and similar remedies.

Bronchoscopic Treatment: The bronchoscope is an instrument which is inserted into the bronchial tubes to examine the bronchi or abscesses opening into them. Lung abscesses are now treated with a great deal of success by various antiseptics applied through a bronchoscope. The instrument is passed into the trachea and then into the bronchus on the side where the abscess is located. The abscess cavity is then washed out with various antiseptic solutions. Sometimes argyrol, lipoiodine, bismuth and similar substances are injected into the abscess cavity to promote healing.

Surgical Treatment: The abscesses which are near the surface of the lung or those which do not open into a bronchus, or which cannot be treated by means of a bronchoscope, are treated

by a surgical operation. A portion of a rib is removed, the abscess cavity is opened and drained.

GANGRENE OF THE LUNG

Gangrene of the lung is a condition which occasionally occurs in old, debilitated persons in the course of acute bronchopneumonia or lobar pneumonia, or in the course of any chronic infection of the lung. As the result of the infection, certain portions of the lung degenerate and die.

Symptoms: The symptoms are cough and expectoration of foul-smelling, purulent material. The sputum consists of pus which sometimes contains pieces of lung tissue. The gangrenous part of the lung often develops into a lung abscess.

The disease is treated like lung abscess.

SYPHILIS OF THE LUNG

Syphilis of the lung is a syphilitic involvement of the lung, which occurs in two forms: syphilis of the bronchial tubes and gumma of the lung.

Symptoms: The symptoms are similar to those of chronic pulmonary tuberculosis or lung abscess. The patient has a chronic cough, expectoration of bloody or purulent sputum and loss in weight. The syphilitic nature of the disease is determined by a Wassermann test, and, in the bronchial form, by the examination of the bronchial tubes with a bronchoscope.

The disease is treated by the usual antisyphilitic remedies such as salvarsan, mercury and iodides.

ACUTE PULMONARY EDEMA

Acute pulmonary edema is a condition which occurs suddenly in the course of an acute infectious disease like pneumonia, influenza or typhoid fever. It also occurs in the course of heart disease or chronic nephritis. It is due to a sudden failure of heart action.

Symptoms: The patient suddenly gets very short of breath, cyanotic and develops a cough and frothy, serous or bloody expectoration. In severe cases the appearance of the patient is typical. The expression becomes anxious, the face is covered with beads of cold perspiration, the breathing is accompanied by bubbling sounds or râles and the pulse becomes very rapid

and weak. When the physician examines the patient he finds evidence that fluid has accumulated within the lungs and that the heart action is profoundly disturbed.

Treatment: Acute pulmonary edema requires active and immediate treatment. Heart stimulants, such as caffeine, adrenalin, strychnine, digitalis, atropine, cardiazol and similar remedies, are usually ordered. Some physicians bleed the patient and remove about a pint of blood from an arm vein.

PULMONARY EMBOLISM OR PULMONARY INFARCT

Pulmonary embolism or infarct is a rare complication which sometimes occurs after surgical operations, especially after gall-bladder operations, operations for removing varicose veins, and after gynecological operations.

Cause: The condition develops when a blood clot becomes liberated from the operated region or a neighboring vein. It travels in the blood stream until it reaches one of the arteries in the lungs and blocks a branch of one of the pulmonary arteries.

Symptoms: When the clot lodges in a main branch of one of the pulmonary arteries the patient suddenly develops severe shortness of breath, the face gets blue, the pulse becomes rapid and weak and the patient dies in a few minutes.

If the clot is small and blocks a small branch of one of the pulmonary arteries, an area in the lung is deprived of its blood supply and an infarct develops. As a result the patient suddenly develops pain in the chest, persistent cough and expectoration of small quantities of blood or blood-tinged sputum, and shortness of breath.

Treatment: The severe cases are given heart stimulants such as adrenalin, caffeine, digitalis, cardiazol and similar remedies and inhalations of oxygen; but these measures are usually of no avail. The mild cases are kept in bed, completely at rest, for weeks and are treated like pneumonia cases.

LUNG TUMORS

Lung tumors are new growths which form in the lung. They occur as benign or malignant tumors; that is, noncancerous or cancerous tumors.

The benign tumors of the lung are very rare. They occasion-

ally form in the bronchial tubes, producing symptoms of other forms of lung disease, especially tuberculosis or chronic bronchitis.

When they occur in a brochus they may sometimes be removed through a bronchoscope.

CANCER OF THE LUNG

Cancer of the lung is a cancerous new growth which develops within the lung. It may occur as a primary cancer or a secondary cancer; that is, it may originate in the lung itself or develop from migrated cancer cells or metastases from a cancer in other organs.

The most common forms of cancer from which recurrences frequently develop in the lung are cancer of the breast and cancer of the mediastinum.

Symptoms

The symptoms of cancer in the lung, whether primary or secondary, may be divided into two groups:

1. Lung and pleural symptoms.
2. Pressure symptoms.

Lung Symptoms: The lung symptoms are not characteristic and they may resemble tuberculosis or any other chronic pulmonary condition. The patient complains of pain in the chest, cough, and expectoration. Occasionally the expectoration may be bloody. The characteristic symptom, however, is the development of a pleurisy with effusion; that is, an accumulation of fluid in one or both sides of the chest. When the quantity of fluid in the chest is large, the patient complains of shortness of breath. When some of the fluid from the chest is aspirated, it is usually found to be bloody. Sometimes cancer cells may be found in the fluid by special microscopic examination.

Pressure Symptoms: As the cancerous growth in the lung extends into the neighboring structures, it produces various symptoms due to pressure on other organs in the chest. Paralysis of the vocal cord may result when there is pressure on the recurrent laryngeal nerve. One pupil may become dilated when one of the sympathetic nerves is pressed upon. Progressive difficulty in breathing may occur when the cancerous growth presses on the trachea.

Sometimes cancerous nodules form in the neck and some of them may be felt above the clavicle.

Treatment: Cancer of the lung is not amenable to treatment, because the disease is so extensive when it can be recognized that nothing can be done. X-ray and radium, however, are usually tried.

DISEASES OF THE PLEURA

PLEURISY

Pleurisy is an inflammatory disease of the pleura. It occurs in two forms: dry pleurisy and pleurisy with effusion.

Dry pleurisy, fibrinous or plastic pleurisy, is an acute inflammation of the pleura characterized by a deposit of fibrin on the pleural surface of the lung and the inner surface of the chest.

Pleurisy with effusion, or serofibrinous pleurisy, is an inflammation of the pleura which results in the accumulation of serum within the chest.

Diaphragmatic pleurisy is a form of pleurisy in which the inflammation occurs on the under surface of the lung and the upper surface of the diaphragm.

Cause: Pleurisy is frequently a complication of acute lobar pneumonia and is part of the inflammatory process in the lung. It sometimes occurs in acute rheumatic fever. It often follows exposure to cold and wet. An injury to the chest, such as a broken rib, by irritating the pleura, may also cause pleurisy. The most common cause of repeated attacks of pleurisy, especially of pleurisy with effusion, is tuberculosis.

Symptoms

Dry pleurisy sometimes begins suddenly with a chill and a slight rise in temperature. The characteristic symptom is a sharp pain in the chest, especially on breathing, usually accompanied by a dry cough without expectoration. The patient prefers to lie on the affected side because breathing is painful. In pneumonia pleurisy is indicated when the patient has pain in the chest in addition to the other symptoms. In diaphragmatic pleurisy the pain is sometimes present in the right upper quadrant of the abdomen.

When the physician examines the patient's chest he hears a rubbing sound on breathing, due to the roughening of the pleural surface.

In pleurisy with effusion there is shortness of breath and sometimes cyanosis in addition to the usual symptoms of

pleurisy, especially when there is a large quantity of fluid in the chest.

The physician obtains a flat or dull sound on tapping the chest and diminished breathing sounds. An X-ray of the chest also demonstrates the fluid.

Treatment: As a rule, dry pleurisy usually subsides gradually. The chest is usually strapped with adhesive plaster to limit movement of the chest during breathing. To relieve the pain and cough, codeine, aspirin, phenacetin and similar substances are ordered.

A patient with pleurisy with effusion should be confined to bed. The fluid is gradually absorbed, but when the quantity is large and the patient complains of severe shortness of breath, it is often removed by aspiration.

When the pleurisy is due to tuberculosis the patient should be treated like a case of tuberculosis.

HYDROTHORAX

Hydrothorax is the accumulation of serum in the chest cavity. When the fluid is bloody it is called hemothorax.

Cause: The condition usually occurs in heart disease, nephritis or cancer of the lung.

Pathology: In heart disease when the heart is decompensated; that is, unable to maintain an adequate circulation, the blood flow is retarded, the veins become engorged with blood, and serum passes into the pleural cavity. In nephritis, when the kidneys are unable to eliminate water, serum accumulates throughout the body and sometimes in the thorax or pleural cavity. Cancer of the lung, by irritating the pleura, also causes an accumulation of fluid in the chest, which is usually bloody.

Symptoms

The symptoms only occur when there is a large quantity of fluid in the chest. The patient develops shortness of breath, and, in heart disease, cyanosis as well. In addition, all the symptoms of the causative disease, such as the heart disease, kidney disease, cancer of the lung, etc., are present.

Treatment

The fluid in the chest is usually absorbed when its causative disease is successfully treated; otherwise it is removed by aspi-

ration. In heart disease, when the decompensation is relieved, by rest in bed and digitalis, the fluid in the chest usually disappears. In nephritis, when the kidneys excrete more urine, the hydrothorax may disappear.

Thoracentesis: This is a method for removing fluid from the chest by means of an apparatus known as a Potain Aspirator. The apparatus consists of a bottle with a stopper containing a special two-way tube and a special aspirating syringe.

The operation is performed by inserting a needle and trocar into the chest. The trocar is removed and the needle is attached to one of the branches of the two-way tube and its stopcock is closed. The aspirating syringe is then attached to the other branch of the two-way tube and air is pumped out of the bottle, thus creating a vacuum. The stopcock of the tube leading to the chest is then opened while the other is closed, when the fluid from the chest is gradually sucked into the bottle.

The nurse should have whisky and other stimulants ready whenever aspiration of the chest is performed, because some patients develop shock during the procedure. Sometimes the removal of fluid from the chest produces a sudden attack of coughing and expectoration of serum. This condition is not serious and usually subsides.

EMPYEMA

Empyema or purulent pleurisy is an acute inflammation of the pleura characterized by the formation of pus within the pleural cavity.

Cause: Empyema usually occurs as a complication of pneumonia, either bronchopneumonia or lobar pneumonia. It is more common in children than in adults. It sometimes results from the perforation of a cheesy tuberculous spot on the surface of the lung, into the chest cavity. The injury or perforation of the lung by a fractured rib or other injury of the chest may also produce an empyema.

Pathology: The disease process consists in the formation of pus in the chest cavity which may be a thin, serous fluid or a thick, creamy pus. It may fill the entire pleural cavity or only part of it, or form a localized abscess.

A sacculated empyema is an abscess within the pleural cavity surrounded by adhesions. An interlobar empyema is a small abscess which forms between the lobes of a lung.

Symptoms

The symptoms of empyema are principally the symptoms of fluid in the chest, associated with a high temperature, rapid pulse, and the evidence of pus, as indicated by the increased number of leucocytes in the blood.

The fluid in the chest causes shortness of breath and sometimes cyanosis. The affected side of the chest is usually held rigid and does not move with respiration, and sometimes the intercostal spaces bulge. The temperature is quite high, 102° or 103° F., and the pulse is rapid.

When the physician examines the chest he determines that it contains fluid by the flat sound obtained on percussing the chest, by the change in breathing sounds and sometimes by X-ray examination of the chest.

In order to determine that the fluid in the chest is pus, the physician usually inserts a small needle into the chest and withdraws some of the fluid with a syringe.

Treatment: The treatment of empyema is surgical. An incision is made between the ribs and the pus is drained. The usual operation consists of removing a piece of rib in order to drain the chest cavity sufficiently.

PNEUMOTHORAX

Pneumothorax is a condition in which the chest cavity fills up with air.

Hydropneumothorax is a condition in which both air and fluid are present in the chest cavity.

Pyopneumothorax is a condition in which both air and pus are present in the chest cavity.

Cause: Pneumothorax usually results from the perforation of a tuberculous spot in the lung. As a result some of the air sacs open into the pleural cavity and air enters and accumulates in the chest cavity. It sometimes occurs after a stab wound or other injury to the chest which allows air to get into the chest from the outside. When infectious material gets into the chest with the air, a pyopneumothorax or hydropneumothorax develops.

Symptoms

The patient suddenly develops a severe, sharp pain in the chest, marked shortness of breath and cyanosis. In pyopneu-

mothorax these symptoms are associated with high temperature.

When the physician examines the chest he obtains a drumlike tone on tapping the chest and characteristic changes in the breathing sounds.

When air and pus or fluid are present together, the physician obtains a characteristic splashing sound while listening to the chest, and moving the patient from side to side. X-ray examination of the chest shows the presence of air or air and fluid in the chest cavity.

Treatment: The patient should be kept absolutely quiet, in bed, until the air is completely absorbed, which usually takes several weeks. Pyopneumothorax is treated by aspiration, or by an operation to remove the pus.

CHAPTER XIX

DISEASES OF THE HEART

Physiology of the Circulation

The blood supplies all the organs and tissues in the body with nourishment and carries away their waste products. It reaches them through numerous small elastic tubes, the arteries, which gradually divide into smaller and smaller branches, finally ending in capillaries. The blood is kept constantly flowing through these vessels by the rhythmic action of the heart, a muscular pump. The impure blood is constantly brought back to the heart by means of another system of tubes, the veins. The flow of blood to the tissues and organs from the heart through the arteries, and to the heart through the veins, is called the circulation of the blood.

Physiology of the Heart: The heart is a pear-shaped, hollow, muscular organ about the size of a fist, situated in the left side of the chest. It consists of four chambers, two auricles and two ventricles. The auricles are the chambers which receive the blood into the heart. The ventricles expel the blood from the heart through the main arteries to the various organs and tissues of the body. The right auricle receives the blood containing waste products from the upper part of the body, through the superior vena cava, and from the lower part of the body through the inferior vena cava.

The blood is forced by the contraction of the right auricle into the right ventricle. The contraction of the right ventricle then forces the blood through the pulmonary artery to the lungs. Here the red blood corpuscles give up their carbon dioxide which they have been carrying as a waste product and replace it by oxygen from the air sacs of the lung. This oxygenated blood now flows back to the heart through the pulmonary veins to the left auricle. The left auricle then contracts and forces the blood into the left ventricle. The contraction of the left ventricle forces the blood into the aorta. It is then carried by its various branches to the organs and tissues, bringing them necessary

oxygen and nourishment. In exchange for the oxygen the hemoglobin of the red blood cells takes up carbon dioxide and carries it back to the right auricle and then to the lungs.

The continual flow of blood is maintained by the regular rhythmic contraction of the heart and occurs in normal healthy individuals about seventy-two times a minute. Each contraction consists of two phases: (1) the systole or period of contraction, when the cavities of the heart become smaller and expel their contents, (2) the diastole or period of relaxation or period of rest, which follows the systole. During this time the heart dilates and fills up with blood.

The Heart Valves: The heart contains four valves, the tricuspid, the mitral and two semilunar valves. The function of the valves is to prevent a back flow of blood.

The tricuspid valve is situated between the right auricle and right ventricle. It prevents back flow of the blood from the right ventricle to the right auricle. The bicuspid or mitral valve is situated between the left auricle and the left ventricle. It prevents back flow of blood from the left ventricle to the left auricle.

The pulmonary semilunar valves are situated at the opening of the pulmonary artery and right ventricle and prevent the back flow of blood from the pulmonary artery into the right ventricle. The aortic semilunar valves are situated at the opening of the aorta and left ventricle and prevent the back flow of blood from the aorta into the left ventricle.

Mechanism of Heart Contraction: The heart action is caused by rhythmic contractions of the heart muscle. The contraction begins in the auricles at the sinus node, a spot where the superior vena cava and inferior vena cava enter. It is transmitted along a bundle of muscle fibers which runs in the septum of the heart, called the auriculoventricular bundle, or bundle of His. The contractions of the ventricles then follow, and pump the blood into the arteries. Each contraction is followed by a period of relaxation or diastole.

The auricles and ventricles are capable of contracting independently of one another. This happens in certain diseases of the heart when the rhythm of the auricles is different from that of the ventricles. The auricles then contract about three times as fast as the ventricles, whose intrinsic rate is about forty a minute.

Factors which Modify Heart Action: The heart action can be modified by nerve impulses and by the width of the blood vessels.

The heart is supplied by two sets of nerves: the accelerator branches of the sympathetic nervous system and the Vagus or inhibitory nerves.

The accelerator nerves carry impulses from the medulla of the brain to accelerate heart action; that is, they make the heart beat stronger and faster.

The Vagus or inhibitory nerves carry impulses which make the heart beat slower.

The caliber of the blood vessels, especially the terminal arterioles, also influences heart action. These vessels contain tiny muscle fibers which make the blood vessels narrow when they contract and wider when they relax. When the caliber of the blood vessels is made narrower, they offer more resistance to the flow of blood and the heart contraction is increased. When the caliber of the terminal arterioles is increased, the heart action is less forcible because the wider vessels offer less resistance to the flow of blood.

Symptoms of Heart Disease

The symptoms of heart disease are produced when there are structural changes in the heart or its blood vessels, when the heart is unable to maintain an adequate circulation, when the heart rhythm is disturbed, or when the nervous control of the heart is modified.

Certain structural changes in the heart often produce only slight symptoms but characteristic signs which the physician is able to recognize when he examines the patient.

When the heart is unable to maintain an adequate circulation the following symptoms result: dyspnea or shortness of breath, cyanosis, a blue color of the skin, edema or swelling of the tissues and diminished secretion of urine.

When the heart rhythm is disturbed the heart action and pulse rate become irregular.

When the nervous control of the heart is affected, palpitation, fainting attacks and changes in rate are the common symptoms.

The nurse's function in disease of the heart is to record the patient's symptoms, to observe those objective symptoms which do not require examining the patient, to carry out the physician's orders intelligently and to note and record the effects of remedies and methods of treatment.

From the nurse's standpoint therefore the symptoms may be divided into two groups: subjective and objective symptoms.

Subjective Symptoms

The most common subjective symptoms in heart disease are the following:

Pain.
Dyspnea.
Orthopnea.
Palpitation.
Syncope.

Pain: The pain of heart disease is usually referred to the region of the precordium, that is, the area of the chest behind which the heart lies. The pain may be described as a sense of pressure or as a sharp or sticking pain. Some patients complain only of a tight sensation in the chest. In some forms of heart disease the pain is characteristic. In angina pectoris, for example, the pain is a severe sense of pressure or a sharp knifelike pain which extends up to the left shoulder, down the left arm to the little and ring finger.

Dyspnea: Dyspnea or shortness of breath is a frequent subjective and objective symptom of heart disease. It is one of the first symptoms to occur in failing heart action or cardiac insufficiency. At first the shortness of breath develops only on exertion such as climbing stairs or after exercise. Later it becomes constant. It is usually produced when there is engorgement or back flow of blood into the lungs, a condition which develops when the heart is unable to maintain the circulation adequately. The accumulation of blood in the capillaries of the lungs makes the air sacs narrower and the breathing becomes rapid and deeper in order to obtain a sufficient amount of air.

Orthopnea: This is a condition in which the patient can breathe only when he sits up.

Palpitation: Palpitation is consciousness of the beating of the heart. It seldom occurs in organic diseases of the heart, but is common in nervous affections of the heart or in nervous patients.

Syncope: Syncope or fainting attacks are probably due to a sudden momentary weakening of heart action. It occurs especially in nervous women as the result of some psychical shock such as fright, excitement, etc.

A fainting attack is usually treated by cold applications to the face, whisky, aromatic spirit of ammonia, Hoffman's anodyne, etc.

Objective Symptoms

The objective symptoms are those which the nurse or physician can observe. The nurse, however, can only observe those objective signs which can be obtained without examining the patient or using various instruments.

Objective Symptoms to be Observed by the Nurse

When nursing a patient with heart disease or disease of the blood vessels the nurse should observe and record the following symptoms:

1. The pulse.
2. Dyspnea.
3. Cyanosis.
4. Edema.
5. Visible pulsation.
6. The daily quantity of urine.

The Pulse: The character of the pulse is frequently changed in heart disease. It may be rapid, slow, irregular, bounding, weak or show other changes.

Dyspnea: Dyspnea or shortness of breath is both a subjective and objective symptom and has already been described. When the shortness of breath is severe, the patient can breathe only when he is propped up with pillows or when he sits up, a condition called **orthopnea.**

Cyanosis: Cyanosis or blue color of the skin is a common symptom in certain forms of heart disease. It is usually accompanied by dyspnea. In mild cases the color of the skin is purple. It may also be caused by diseases of the lungs or blood. It occurs principally on the face, on the neck, or other parts of the skin. The hands and fingers are often blue.

Cyanosis is caused by the dark color of the blood which results when the hemoglobin of the red blood corpuscles cannot obtain sufficient oxygen in the lungs. In heart disease this occurs when the heart is unable to maintain an adequate circulation. As a result, the capillaries in the lungs become engorged, the air sacs are compressed and the patient is unable to obtain sufficient oxygen.

Edema: Edema or dropsy is a puffy, swollen condition of the skin and tissues underneath. The skin pits on pressure; that is, a depression is left on pressing the skin with the fingers. In heart disease edema usually occurs in the extremities, but

it may occur in the abdominal wall or over the entire body as well. When the patient is in bed it often occurs first on the back. In mild cases it develops only on exertion or toward the end of the day.

Edema is produced by the accumulation of serum in the tissues. When the heart is decompensated, that is, unable to maintain an adequate circulation, blood accumulates in the blood vessels in the lower extremities and other parts of the body. The serum of this blood gradually oozes into the tissues. Edema also occurs in nephritis, but it is more general than in heart disease.

Visible Pulsation: In some forms of heart disease throbbing or pulsation of the veins in the neck may be seen. Pulsation in the neck and sometimes of the chest wall frequently occurs in aneurysm (dilatation) of the aorta. A capillary pulse is visible pulsation of the capillaries. It is best observed in the nails. It occurs especially in aortic regurgitation (leaking aortic valve).

Urinary Output: When the heart is decompensated the daily output of urine is often diminished and when the decompensation improves the output of urine is increased. It is therefore essential for the nurse to record the quantity of urine passed in twenty-four hours.

Methods of Examination Used by the Physician

The physician recognizes diseases of the heart and blood vessels by examining the heart by the usual methods and with various instruments. He observes whether the patient has dyspnea, cyanosis or abnormal pulsations. He feels the pulse to determine its rate, rhythm and strength. Sometimes the area of the chest over the heart is felt to note whether the heart action produces a thrill, that is, an abnormal impulse. The size of the heart is determined by percussing or tapping the chest. When the physician listens to the heart with a stethoscope he hears characteristic sounds produced by the contraction of the heart. Normally the sounds produced are "lubb dupp." In certain diseases of the valves of the heart characteristic sounds or "murmurs" are produced.

Instrumental Methods of Examination

The following methods of examination are frequently used in diseases of the heart and blood vessels:

1. Blood Pressure Determination.

2. X-ray Examination of the Heart.
3. Examination with the Electrocardiograph.
4. Examination with the Polygraph.

Blood Pressure: The blood pressure is the pressure of the current of blood within the arteries. It is determined by an apparatus known as a sphygmomanometer. The method of taking blood pressure will be described under disturbances of blood pressure, see page 238.

X-ray Examination: The size of the heart, the shape of the large vessels in the thorax, or the presence of aneurysms in them is often recognized by X-ray examination.

Electrocardiographic Examination: The heart action is frequently studied by means of an instrument called an electrocardiograph.

The heart is a muscular organ and all muscular contractions produce an electric current. The contraction of the heart muscle produces fine electric currents which can be recognized by the electrocardiograph. The electric current produced by the normal contraction of the heart is recorded in the apparatus as a characteristic curve. When the heart action is abnormal a change in this curve is produced. Electrocardiographic examination is especially valuable to study disturbances in the rhythm of heart action or the origin and nature of various types of irregular pulse.

An electrocardiogram or curve of the heart muscle contraction is made by allowing the patient to sit in a chair and applying electrodes to different parts of the body. The current developed by the contraction of the heart produces the characteristic curves.

Examination with the Polygraph: The polygraph is an instrument which records the heart beat and the filling of the blood vessels. The normal heart action produces a characteristic curve on a moving slip of paper, and various diseases of the heart produce changes in this curve. The physician is often able to determine the exact nature of disturbances in rhythm by polygraphic examination of the heart and blood vessels.

DISEASES OF THE HEART

Diseases of the heart may be divided into the following groups:

1. Diseases of the Endocardium.

2. Diseases of the Valves.
3. Diseases of the Heart Muscle.
4. Diseases of the Pericardium.
5. Diseases of the Blood Vessels in the Heart.
6. Disturbances in Rate and Rhythm.
7. Disturbances in Blood Pressure.

DISEASES OF THE ENDOCARDIUM

ENDOCARDITIS

Endocarditis is an inflammation of the endocardium or lining membrane on the inside of the heart. It occurs in three forms as follows:

1. Acute Endocarditis.
2. Bacterial Endocarditis.
3. Chronic Endocarditis.

ACUTE ENDOCARDITIS

Acute endocarditis is an acute inflammation of the endocardium or inner lining of the heart.

Cause: The disease usually occurs as a complication of acute rheumatic fever or chorea. It frequently follows repeated attacks of acute tonsillitis. It may occur as a complication in other infectious diseases, such as pneumonia, scarlet fever, or diphtheria. It is frequently associated with an acute myocarditis and pericarditis.

Pathology: The disease process affects principally the valves of the heart and sometimes the inner lining as well. The valves become inflamed and their surface becomes roughened. Sometimes small clots form on the inflamed areas. The mitral valve is commonly affected, and sometimes the aortic valves. When the inflammation subsides the valves may be left entirely normal. Frequently, however, the valves become permanently deformed and defective by the scar formation which results when the inflammation subsides.

Symptoms

The characteristic symptoms are pain over the heart, a rapid pulse, and temperature.

When endocarditis develops as a complication, for example, in acute rheumatic fever, the temperature of the original illness persists and the heart symptoms develop gradually.

The physician recognizes the disease when, on listening to the heart with a stethoscope, he hears a "murmur," an abnormal sound which replaces or accompanies the heart sounds.

In severe cases the temperature increases steadily and the patient may develop shortness of breath, cyanosis and sometimes failing heart action.

In mild cases the symptoms gradually subside, leaving no sequel whatever. In many patients the affected valves become permanently defective and valvular disease of the heart results.

Treatment

The measures used to prevent acute endocarditis are intensive treatment of acute rheumatic fever, chorea and other infections in which it occurs as a complication. In rheumatic fever large doses of salicylates are given and the patient should be kept as quiet as possible. In pneumonia, diphtheria, and all infections which may be complicated by an acute endocarditis, the patient should be kept in bed as long as the pulse shows the slightest change in rate or rhythm.

When the endocarditis is manifest, the patient is kept in bed, and an ice bag is kept continuously over the heart area. For the pain, various sedatives or morphine are ordered. When the symptoms of failing heart action develop, such as shortness of breath, cyanosis, etc., various preparations of digitalis are administered. If a permanent valvular defect of the heart develops the patient is kept in bed until the heart is thoroughly compensated, that is, until the slightest exertion does not produce any shortness of breath or a rapid pulse.

BACTERIAL ENDOCARDITIS

Bacterial endocarditis is a form of acute endocarditis in which the causative bacteria circulate in the blood stream. It is also called septic, infectious, ulcerative or malignant endocarditis.

Cause: The disease is caused by various bacteria, especially the streptococcus viridans, the influenza bacillus, the pneumococcus or gonococcus. It is usually part of a bacteriemia and may occur as a complication in pneumonia and other infections. It frequently develops in chronic endocarditis or valvular disease of the heart. The form caused by the streptococcus viridans usually runs a subacute course.

Pathology: The disease process affects principally the valves

in the heart. They become inflamed, thickened or ulcerated. Sometimes small blood clots are deposited on the valve flaps or the inflammation forms small wart-like thickenings. The blood contains the causative bacteria and clots form in the blood vessels. Some of the clots are carried as emboli in the circulation and lodge in the spleen, the kidneys, the lungs, the brain and other organs, forming infarcts; that is, gangrenous or dead areas.

Symptoms

The symptoms may be divided into three groups:

1. Heart Symptoms.
2. Symptoms of Bacteriemia.
3. Hemorrhages and Emboli.

Heart Symptoms: The patient may have pain in the heart region and shortness of breath. The physician may hear a new "murmur" caused by a fresh ulceration on a valve or old "murmurs" indicating old valvular disease of the heart. The heart symptoms are frequently latent and develop toward the end of the disease.

Symptoms of Bacteriemia: The chief symptom of the bacteriemia is a septic or intermittent fever and rapid pulse, frequently accompanied by severe chills and profuse sweats. The temperature, however, may be continuous, remittent, or irregular. In the form of the disease caused by the streptococcus viridans there may be latent periods during which the patient is entirely free from fever. Some patients develop delirium and coma, especially when the fever is high. As the disease progresses the patient becomes anemic and weak.

The nature of the disease is definitely recognized when the causative germ is isolated in the blood by taking a blood culture.

Hemorrhages and Emboli: A typical case of bacterial endocarditis usually develops hemorrhages and emboli sooner or later. The hemorrhages may be very small and occur in the skin of the chest or abdomen or in the retina of the eye. The emboli are blood clots which are carried in the circulation and lodge in various organs. An embolus may lodge in one of the arteries in the spleen and cause sudden severe pain in the upper part of the abdomen. When it occurs in the kidney the patient develops pain in the back and passes blood in the urine. When a clot blocks one of the small branches of the coronary arteries, the patient gets a sudden attack of pain over the heart region

and may die suddenly. An embolus in the brain may cause paralysis of an arm and leg on the same side of the body (hemiplegia) or other forms of paralysis or even sudden death. An embolus in the lungs may obstruct a main branch of one of the pulmonary arteries. The patient gets a sudden severe pain in the chest, shortness of breath and dies suddenly. When a smaller branch is blocked, pain in the chest, cough, and bloody expectoration develop.

Treatment

Bacterial endocarditis is usually a fatal disease. There is very little that can be done in acute infections to prevent its occurrence, but fortunately it is not a common complication. In chronic valvular disease the physician frequently removes infected tonsils or teeth to prevent bacterial endocarditis and other serious injuries to the heart.

When the disease is manifest various serums or vaccines are used against the causative germ. A recent treatment consists of injecting solutions of acriflavine, mercurochrome, gentian violet, acriviolet, and similar antiseptics into the blood. Transfusions are also given to help the patient overcome the infection. Before the transfusion the donor is sometimes immunized by repeated injections with vaccines made from the causative germs.

The heart symptoms are treated by the usual heart remedies, such as digitalis, caffeine and similar remedies.

CHRONIC ENDOCARDITIS

Chronic endocarditis is a chronic disease which affects the lining membrane of the heart, particularly the valves.

Cause: The disease may be the result of acute endocarditis. It may be caused by repeated attacks of acute rheumatic fever, by syphilis or focal infections. It is frequently part of a general arteriosclerosis or senile changes throughout the body.

Symptoms: The symptoms are principally those of valvular disease of the heart. The valves are unable to open or close sufficiently as a result of scar tissue formation in their flaps.

CHRONIC VALVULAR DISEASE OF THE HEART

Chronic valvular disease of the heart is a disease in which the valves of the heart do not close or open sufficiently.

Cause: The disease is usually caused by endocarditis of the

valves, following acute rheumatism or syphilis or by arteriosclerosis.

Pathology: The endocarditis caused by rheumatism usually affects the mitral valve more than the aortic. The syphilitic form usually involves principally the aortic valves, and is usually part of a syphilitic process affecting the wall of the aorta and the neighboring valves. The chronic endocarditis which is associated with arteriosclerosis or with senile changes may affect the mitral valve, the aortic valve or the wall of the heart. This process consists of gradual connective tissue formation and thickening of the walls of the fine blood vessels within the heart.

The valves become deformed as a result of thickening or scar formation which follows the rheumatic or syphilitic process or chronic endocarditis. Sometimes there are no changes in the valves themselves, but the valve opening becomes larger when the heart or the aorta is dilated.

The mechanical difficulties resulting from the deformed valves are of two kinds:

1. Regurgitation.
2. Stenosis.

Regurgitation is a condition in which the valves do not close completely and blood flows back through the partially closed valves. For example, in mitral regurgitation the blood flows back into the left auricle after every contraction of the left ventricle.

Stenosis is a condition in which a valve does not open wide enough. Consequently there is difficulty in forcing the blood through the narrow opening. For example, in aortic stenosis, all the blood in the left ventricle cannot be forced through the narrow aortic valve.

Symptoms

The symptoms of valvular disease may be divided into two groups:

1. Symptoms during Compensation.
2. Symptoms of Decompensation.

Compensation

Compensation is a condition which enables the heart to maintain an adequate circulation in spite of defective valves.

When a valve does not close sufficiently some of the expelled blood flows back into the auricle or ventricle after each con-

traction. When it does not open completely, some of the blood may remain in the auricle or ventricle after each contraction. Consequently the heart becomes enlarged and thickened or hypertrophied in order to expel the extra blood from the ventricle or auricle. A normal circulation is thus maintained and the heart is said to be compensated.

Symptoms During Compensation: When the heart is compensated there are usually no symptoms. Occasionally, however, palpitation, pain over the heart area, slight shortness of breath on exertion, or undue fatigue are present in some forms of valvular disease.

In spite of the relative absence of symptoms, however, the physician is able to recognize the valvular defect by "murmurs" or changed heart sounds, which he hears with a stethoscope, and by signs indicating enlargement of the heart.

Murmurs: The contraction of the normal heart produces characteristic sounds resembling "lubb dupp." Murmurs are abnormal sounds produced when the valves are defective. They may accompany or replace the normal sounds of the heart, and they are sometimes temporary. There are three kinds of murmurs: systolic, diastolic and presystolic.

Systolic murmurs are sounds which accompany or replace the first sound of the heart.

Diastolic murmurs occur after the second sound of the heart.

Presystolic murmurs are usually rumbling sounds which are heard just before the first sound of the heart.

The physician is able to recognize the specific valvular defect by the kind of murmur he hears, and by the region of the heart area where the murmur is heard loudest.

Decompensation

Decompensation is a condition in which the heart is unable to maintain an adequate circulation of blood. It is also called failing compensation or cardiac insufficiency. The condition usually occurs in valvular disease, but it may also occur in other forms of heart or vascular disease, such as myocarditis, arteriosclerosis, hypertension, etc. The attacks of decompensation may recur and each subsequent attack is apt to be more serious than the previous one.

Cause: Decompensation usually develops from unusual exertion, hard work, or when pneumonia, tonsillitis, typhoid fever, or other infections occur in a patient with heart disease, or when nephritis develops. It sometimes results from continued absorp-

tion of poisons from infected tonsils or teeth. It may also occur as a manifestation of advancing years on a diseased heart.

Mechanism: The normal heart has reserve power with which to maintain the circulation under strain, hard work, excessive exercise, etc. In valvular heart disease the heart is able to maintain an adequate circulation only by utilizing this reserve power continuously. When the patient with valvular heart disease is under the extra strain of hard work, infections, etc., the heart is unable to maintain an adequate circulation because its reserve power is already exhausted. Consequently the flow of blood is retarded and various organs become engorged with blood or congested. The lungs are the first organs in which this occurs because the valvular defect in the mitral or aortic valve causes a back flow of blood into the lungs through the pulmonary veins. The lung capillaries become filled with blood and compress the air sacs. As a result the patient has to breathe deeper and faster in order to obtain the necessary air, thus producing dyspnea. Even with the increased breathing, however, he is still unable to obtain a sufficient amount of oxygen, and the patient becomes cyanosed. If the decompensation continues the veins throughout the body become engorged with blood and the serum gradually passes through the walls of the blood vessels into the tissues and edema is produced. The edema is usually more marked in the dependent portions of the body, in the lower extremities when the patient is up and about and in the back and buttocks when the patient is lying down. The liver often becomes engorged with blood and enlarged. The kidneys become congested and the secretion of urine is diminished.

Symptoms

The symptoms of failing compensation usually develop gradually, but they may occur suddenly. The principal symptoms are shortness of breath, cyanosis, swelling of the extremities or accumulation of fluid in other parts of the body, and the symptoms of congestion or engorgement in various organs.

Dyspnea: The dyspnea or shortness of breath is the earliest symptom of failing compensation. At first it occurs only on exertion when walking up the stairs or lifting a heavy weight. Gradually it becomes more marked and is present all the time. The patient can breathe only if he sits up or if he is propped up with pillows.

Cyanosis: At first the lips and ears are purple in color. Later the entire face and skin of the rest of the body becomes blue or cyanotic, and the veins in the neck stand out prominently.

Edema: In mild cases the ankles are puffy, especially at night, and in patients confined to bed the edema occurs first on the back. In severe cases the legs and thighs, and finally the abdominal wall becomes swollen and fluid accumulates in the abdomen.

Pulse: The pulse is frequently characteristic of the type of heart disease causing the decompensation. It is usually rapid and weak, but it may be irregular or slow.

Kidney Symptoms: The daily output of urine becomes diminished as the result of retarded circulation in the kidneys. The urine frequently contains albumin and casts.

Gastric and Intestinal Symptoms: Nausea, vomiting, and pain in the stomach often develop in the course of decompensation as the result of congestion in the stomach.

Diarrhea may result from congestion in the intestines.

Liver Symptoms: Jaundice frequently develops from passive congestion of the liver. The liver often becomes considerably enlarged.

Common Forms of Valvular Heart Disease

The most common valvular defects are the following:

1. Mitral regurgitation.
2. Mitral stenosis.
3. Aortic regurgitation.

Tricuspid regurgitation and aortic stenosis are rare forms of valvular disease.

Mitral Regurgitation

Mitral regurgitation is a disease of the mitral valve in which the flaps of the valve do not close completely. It is the most common form of valvular disease and is usually due to rheumatic endocarditis. As a result of the defective valve some of the blood flows back into the auricle during each systole. The heart muscle becomes thickened and the heart becomes enlarged in order to overcome the leaking valve.

Symptoms: The patient is usually free from symptoms unless decompensation develops. The physician, however, is able to recognize mitral regurgitation by a characteristic blowing murmur which accompanies or replaces the first sound of the heart.

Mitral Stenosis

Mitral stenosis is a disease of the mitral valve in which the valve opening becomes narrow. The condition usually follows

rheumatic endocarditis. In order to expel the blood through the narrow opening the wall of the left auricle becomes thickened.

Symptoms: When the valve defect is compensated the patient is relatively free from symptoms except for occasional palpitation or nose bleed. The physician recognizes mitral stenosis by a loud rumbling murmur which occurs before the first sound of the heart (presystolic murmur), and by a characteristic thrill felt on placing the hand over the heart area, and evidence of an enlarged heart. The pulse is frequently small, weak and irregular.

In mitral stenosis small clots sometimes form on the valve flaps. They are often carried as emboli in the circulating blood and lodge in various parts of the body, especially in the brain, causing a hemiplegia or "stroke."

When decompensation occurs the usual symptoms of this condition develop.

Aortic Regurgitation

Aortic regurgitation is a disease of the aortic valves in which the valves do not close completely. It is usually caused by a syphilitic condition of the aortic valves, or of the wall of the aorta near the valves. It may also develop in aneurysm of the arch of the aorta, arteriosclerosis of the aorta and occasionally in rheumatic endocarditis. The dilated aorta or the deformed valve prevents the valves from closing completely after each contraction of the left ventricle, and blood leaks back into the ventricle. To overcome this leakage the heart gradually becomes enlarged and the left ventricle becomes thickened. The heart is thus able to contract more vigorously and expel the blood from the left ventricle.

Symptoms: The patient frequently complains of pain in the heart region and may get attacks of angina pectoris. The physician recognizes aortic regurgitation by a characteristic murmur (diastolic murmur) which he hears just after the second sound of the heart, by evidence of an enlarged heart, and by hearing a characteristic "pistol shot" sound over any of the large arteries. The leaking aortic valve produces sudden filling of the arteries, followed by a sudden back flow. This causes characteristic pulse changes known as a Corrigan pulse and Capillary pulse.

The Corrigan pulse is a characteristic full bounding pulse. A capillary pulse is pulsation of the capillaries which may be seen wherever capillaries are visible. It may be readily seen in the nails by applying slight pressure.

When decompensation occurs the usual symptoms of this condition develop.

Aortic Stenosis

Aortic stenosis is a very rare form of valvular disease of the aortic valves. It is caused by scar formation within the valves so that they do not open sufficiently. It is most commonly produced by arteriosclerosis, when it involves the aortic valves. As a result, the opening in the valves becomes narrow and an insufficient amount of blood is expelled with each systole of the left ventricle. The heart overcomes this difficulty by marked enlargement of the left ventricle and thickening of its wall.

Symptoms: The patient frequently gets fainting attacks and pain over the heart area. The physician recognizes the condition by hearing a blowing murmur which replaces or accompanies the first sound of the heart and occurs with the systole of the left ventricle. The heart is also markedly enlarged and the pulse is usually very small and slow.

When decompensation occurs the usual symptoms of this condition develop.

Tricuspid Regurgitation

Tricuspid regurgitation is a disease of the tricuspid valve which prevents them from closing sufficiently. This is a rare condition and usually develops when the right ventricle of the heart is dilated in failing compensation. In this condition the heart often becomes dilated, the valve flaps become separated and blood leaks into the right auricle from the right ventricle. Consequently there is a back flow of blood from the right ventricle into the right auricle, and then into the superior and inferior vena cava and through the latter into the portal veins. The liver therefore becomes engorged with blood, and enlarged.

Symptoms: The symptoms are the usual symptoms of decompensation, shortness of breath, cyanosis and swelling of the extremities.

The physician usually hears a characteristic systolic murmur at the ensiform cartilage, replacing or accompanying the first sound, and can feel a large tender liver which often pulsates.

Combined Valvular Disease

Combined valvular disease of the heart is a disease in which several valves are affected at the same time. The most common forms are mitral regurgitation associated with a mitral stenosis, and aortic regurgitation associated with a mitral regurgitation.

Symptoms: The symptoms depend on the types of valvular disease present. If there is aortic regurgitation there may be pain or attacks of angina. If there is mitral stenosis there may be pain and a tendency to hemorrhage, etc. The physician is able to recognize each valvular defect by its characteristic murmur, pulse changes and other signs. When decompensation occurs the symptoms of this condition develop.

Treatment of Valvular Disease

The methods of treating valvular disease depend on the presence or absence of decompensation.

Treatment During Compensation: When the valvular defect is compensated the patient rarely suffers from any symptoms. However, the mode of life should be adjusted to prevent attacks of decompensation. The patient is usually advised to avoid any strenuous exercise, even climbing stairs, or undue mental strain. In choosing an occupation he should choose one that does not require strenuous physical work. Some physicians, however, advise graduated exercises to accustom the heart to average physical strain.

The patient should not eat excessively, and have regular bowel movements. Overeating and distention of the stomach and intestines with gas, or other fecal matter, puts an extra strain on the heart. It is especially important to remove or treat all foci of infection such as infected teeth, tonsils, or sinuses, because the constant absorption of pus or poisons is especially detrimental to the heart.

School children suffering with valvular disease are usually taught in separate open-air classes. They are given extra milk during the day, their exercise is limited, and undue mental strain is avoided.

Treatment of Decompensation: When the patient suffers from decompensation he is kept in bed, and in mild cases this is frequently all that is necessary. In most cases, however, digitalis and various other cardiac remedies are used. The dosage ordered varies; some physicians give very large doses while others give smaller quantities.

The Eggleston method is a method of giving large doses of digitalis, in proportion to the body weight; about two minims for every pound is given in twenty-four hours. The first dose is half the total dosage; six hours later one-fourth, and six hours after that one-eighth or one-sixth of the original dose is ordered.

In severe cases digitalis is given intravenously or intramus-

cularly. Caffeine, strychnine and similar drugs are also given in some cases.

Effect of Digitalis: The effect of digitalis is noticeable in a few days. The shortness of breath, the cyanosis and the edema gradually subside and the pulse becomes slower and regular. The daily output of urine is increased.

Nursing Care: The nursing in decompensation is especially important. The patient should be kept in bed propped up with a back rest or pillows, preferably near an open window, to get plenty of fresh air. The nurse should note and record the extent of the dyspnea, the cyanosis, and the edema. The daily output of urine should be measured. If the decompensation occurs in the course of an acute infectious disease, the nursing procedures of that disease are carried out. When digitalis is administered the nurse should watch the pulse, note its rate and regularity. A slow and irregular pulse is the first sign of digitalis poisoning.

HYPERTROPHY OF THE HEART

Hypertrophy of the heart is enlargement of the heart. It is usually caused by thickening of the heart muscle, especially the left ventricle.

Cause: The condition develops gradually, principally in valvular heart disease, because a thickened heart muscle is able to contract more forcibly. When a valve leaks (regurgitation) the heart muscle becomes thickened in order to expel the larger quantity of blood which the ventricle contains as the result of leakage after each contraction. When a valve becomes narrow (stenosis) the heart muscle becomes thickened in order to force the blood through the narrow opening. In arteriosclerosis the heart muscle becomes thickened so as to force the blood through the narrow blood vessels.

Symptoms: The hypertrophied or enlarged heart produces no subjective symptoms. It is recognized by the physician by various methods of examination and by the X-ray.

DILATATION OF THE HEART

Dilatation of the heart is a condition in which the cavities of the heart become enlarged, usually when the heart muscle is weak and relaxed.

The condition may occur suddenly, when it is known as **acute dilatation.** It may develop gradually and produce decompensation.

Cause: Dilatation of the heart usually develops when the heart is overtaxed by hard work, unusual exercise, especially in any form of heart disease, and in the course of infectious diseases such as pneumonia, typhoid fever, acute nephritis and other infections.

Symptoms: Acute dilatation may cause sudden death. As a rule, however, the patient complains of shortness of breath and cyanosis and the pulse becomes weak and irregular. The physician is able to recognize the dilated heart by various methods of examination. Murmurs frequently develop because the dilated heart stretches the valves and produces a temporary valvular defect, usually a regurgitation, at the mitral or aortic valve.

Treatment: Acute dilatation is usually treated energetically by various heart stimulants such as adrenalin, digitalis, caffeine, cardiazol and similar heart stimulants. In acute infections many physicians prescribe heart stimulants early in the disease to prevent dilatation of the heart. In heart disease dilatation may be prevented by avoiding unusual strain. When it occurs it is treated by rest, digitalis and other heart stimulants.

CONGENITAL HEART DISEASE

Congenital heart disease is a form of heart disease which occurs at birth.

Cause: The disease may be caused by defective development of the heart or by endocarditis occurring before birth. It frequently results when the opening between the two auricles (the foramen ovale) or the one between the aorta and pulmonary artery fails to close at birth. These openings are necessary for life within the uterus and become closed as soon as the child is born and breathes normally.

Symptoms: The chief symptom of congenital heart disease is marked cyanosis, due to interference with normal circulation. These infants are called "blue babies." The physician may hear certain characteristic murmurs when he listens to the heart area. The form of congenital heart disease due to a persistent opening between the auricles usually subsides because the opening gradually close. In many cases, however, these babies have a blue color for a long time.

The treatment is the same as in other forms of heart disease. The severe cases of congenital heart disease usually die within a few years.

ANGINA PECTORIS

Angina Pectoris is a disease of the heart characterized by attacks of severe sharp pains in the heart which radiate into the arm.

Cause: The condition usually occurs in arteriosclerosis or hardening of branches of the coronary arteries in the heart, or in syphilis of the heart or aorta. Similar attacks of pain may also result from irritation of the sympathetic nerves of the heart or in a reflex manner from gall-stones or gall-bladder disease, or disease of the stomach.

Symptoms: The patient suddenly gets an attack of severe excruciating pain in the region of the heart. The pain is a severe cramp of the heart which radiates to the left shoulder and extends down the left arm to the ring and little finger. The pain may be a sensation of intense pressure and may not radiate. During the attack the face is pale or dusky and is often covered with beads of cold perspiration. The pulse is usually slow, small and tense. The attacks are often brought on by exertion, excitement, overeating or distention of the stomach with gas. They may last a few minutes or several hours.

Treatment

Prevention: A patient subject to attacks of angina pectoris should avoid overeating and should move the bowels regularly. He should live a quiet life and avoid exertion and excitement.

Treatment of the Attack: During the attack the patient is more comfortable if kept in a sitting posture until the attack is over. A hot-water bag applied to the region of the heart sometimes gives relief. Hot drinks or hot whisky are often given. The most commonly used and most effective remedy is amyl nitrite. It is given by breaking an amyl nitrite "pearl" in a handkerchief and allowing the patient to inhale the drug. Nitroglycerin and other nitrites are frequently ordered between the attacks. Diuretin, euphyllin, bromides and atropine are other remedies sometimes given. In severe cases morphine is given hypodermically.

Persistent cases are sometimes treated surgically by excising the ganglia of branches of the sympathetic nerves in the neck.

Coronary Thrombosis

Coronary Thrombosis is a condition in which a branch of the coronary artery becomes blocked by a clot.

Symptoms: If a large artery is obstructed the patient suddenly gets a severe pain in the heart region and dies suddenly. If the clot is a small one the patient gets a severe sharp pain over the heart which radiates to the left shoulder and down the left arm. The attack is similar to angina pectoris, but it lasts much longer, for hours or days. The face has a peculiar dusky color. The pulse is frequently irregular. The physician often hears a "friction rub" on listening to the heart.

The condition is treated in the same manner as angina pectoris.

Pseudo Angina Pectoris

Pseudo angina pectoris is a condition characterized by pain around the heart. It occurs especially in nervous persons.

Symptoms: The patient gets attacks like that of angina pectoris, but they are not characteristic, however, and the symptoms of each attack are not the same. The pain occurs over the heart, but it does not radiate in the same manner as in typical angina pectoris. The patient may also get fainting spells, palpitation of the heart, attacks of weakness, and various nervous symptoms.

Treatment: The condition is treated by various sedatives such as bromides, valerian, luminal, aromatic spirit of ammonia, Hoffman's anodyne and similar remedies.

DISEASES OF THE HEART MUSCLE

MYOCARDITIS

Myocarditis is an inflammatory disease of the heart muscle which occurs in two forms, acute myocarditis and chronic myocarditis.

Acute Myocarditis

Acute myocarditis occurs in the course of certain infectious diseases: in diphtheria, pneumonia, acute rheumatic fever, and typhoid fever, as the effect of toxins. The poisons of these infections may cause inflammation or degeneration of some of the muscle fibers of the heart.

Symptoms: Occasionally the degeneration of the heart muscle is extensive. This may account for sudden death which sometimes occurs in the course of infectious diseases. Usually, however, when myocarditis develops the temperature persists and the

patient complains of pain over the heart area and a rapid and weak or irregular pulse.

Treatment: The patient is kept absolutely quiet in bed, an ice bag is applied to the heart and all exertion is forbidden.

Chronic Myocarditis

Chronic myocarditis is a disease of the heart characterized by the formation of scar or connective tissue within the heart muscle.

Cause: The disease occurs as the result of progressive arteriosclerosis or syphilis, or as the result of an acute myocarditis in the course of infections.

Pathology: In arteriosclerosis branches of the coronary vessels within the heart become thickened. This may interfere with the nutrition of certain parts of the heart muscle. As a result, some of the fibers degenerate and are replaced by connective tissue. Acute myocarditis, or syphilis of the heart may destroy certain portions of the heart muscle, which is then replaced by connective tissue.

Fatty degeneration of the heart is a condition in which fat is deposited between or within the muscle fibers and the heart becomes soft and flabby and enlarged.

Symptoms: The symptoms of myocarditis vary according to the extent and location of the process. If the scar formation occurs in areas of the heart that do not interfere with its function, there may be no symptoms except occasional pain. If, however, important parts of the heart muscle are involved, the patient may have an irregular or slow pulse and sometimes pain over the heart. If the myocarditis involves the region around the coronary arteries, the patient may get attacks of angina pectoris.

In obese people the heart is often fatty and the heart sounds may be very flabby. As the disease progresses unusual strain or infections may produce decompensation, with the usual symptoms: shortness of breath, cyanosis, edema, diminished output of urine and other symptoms.

Treatment: When the heart is compensated the patient is advised to avoid physical and mental strain. The quantity of food is limited and the bowels should be moved regularly. If the pulse is irregular, quinidine, atropine or similar remedies are ordered. If decompensation develops it is treated in the usual manner; see page 220.

DISEASES OF THE PERICARDIUM
PERICARDITIS

Pericarditis is an inflammatory disease of the lining membrane of the pericardial sac which encloses the heart. It occurs in two forms, acute pericarditis and chronic pericarditis.

ACUTE PERICARDITIS

Acute pericarditis is an acute inflammation of the pericardial sac and occurs in three forms:

1. Dry Pericarditis.
2. Pericarditis with Serous Effusion.
3. Purulent Pericarditis.

Cause: Acute pericarditis usually occurs as a complication of acute rheumatic fever or pneumonia. It is especially common in children. The milder forms occur in rheumatic fever, while the more severe forms may follow pneumonia. Purulent pericarditis may follow pneumonia and is a very serious disease.

Pathology: In dry pericarditis the disease process consists of a deposit of fibrin in the pericardial sac, both on the heart itself and on the inner surface of the sac. In the serous form a serous fluid accumulates within the pericardial sac. The fluid may be very small in amount or there may be so much fluid that the pericardial sac becomes markedly distended. Serous pericarditis is usually associated with a similar effusion in the pleural cavity. In the purulent form there is an accumulation of pus within the pericardial sac. Pericarditis is frequently associated with disease of the rest of the heart, such as endocarditis or myocarditis.

Symptoms

The symptoms of pericarditis vary with the type. In dry pericarditis the symptoms are mild and consist merely of the persistence of the fever of the original disease, and pain over the heart area of the chest. When the physician examines the patient he hears a characteristic to and fro rubbing sound on listening to the heart with a stethoscope. This is produced by the rubbing of the roughened layers of the pericardial sac against one another.

When a serous effusion accumulates within the pericardial sac, the pain over the heart area becomes more severe and the patient

develops shortness of breath and cyanosis, which get progressively worse. The patient complains of sleeplessness and looks severely ill. The pulse of pericarditis is characteristic and is known as "pulsus paradoxus." It becomes weak or disappears entirely during deep inspiration. When the physician examines the patient he finds the heart area markedly enlarged, due to the accumulation of fluid within the pericardium, and the heart sounds indistinct.

When there is an accumulation of pus the symptoms are those of an effusion, with the exception that the patient is more severely ill the temperature is very high and there is an increase in the number of leucocytes in the blood.

Treatment

Pericarditis is treated by the following methods:

Nursing Care: The nursing in pericarditis is especially important. The patient should be kept in bed, absolutely quiet, and should move about as little as possible. An ice bag is usually applied over the heart area, but it should not contain large quantities nor large pieces of ice. It should be changed frequently and suspended lightly from the neck, to avoid pressure on the chest. Some physicians prefer a hot-water bag. Cupping, mustard plasters and other local remedies are sometimes ordered.

The diet usually consists principally of milk, to which cooked cereals and carbohydrates are added. When fluid accumulates, the fluid intake is often limited.

Symptomatic Treatment: When the disease occurs as a complication of acute rheumatic fever, large doses of salicylates are often tried. When the symptoms of decompensation, such as shortness of breath, cyanosis, etc., develop, digitalis is ordered. For the restlessness, pain and sleeplessness, morphine, bromides or other sedatives are used. When a large amount of fluid accumulates in the pericardial sac and causes marked shortness of breath and cyanosis, it is sometimes necessary to withdraw the fluid. This is performed by inserting a special instrument, a trocar and canula, into the pericardial sac and aspirating the fluid. When pus accumulates, it is often removed by a surgical operation. The pericardial sac is incised and the pus is withdrawn.

CHRONIC PERICARDITIS

Chronic pericarditis is a chronic inflammation of the pericardial sac.

Cause: The disease is commonly caused by tuberculosis, usually as part of a general pulmonary tuberculosis. It occurs in two forms, adhesive pericarditis or pericarditis with a serous effusion.

Pathology: The adherent form usually results from acute pericarditis, which on healing forms adhesions between the heart and pericardium. In the serous form there is an accumulation of fluid within the pericardial sac.

Symptoms

The chief symptom of chronic pericarditis is pain over the heart area, but pain is frequently absent. Occasionally the ribs in the heart region are drawn together with each heart contraction due to adhesions between the heart and pericardium and neighboring structures. Cardiac decompensation usually develops with shortness of breath, cyanosis and edema.

The symptoms may be associated with other symptoms of tuberculosis. When an effusion develops the heart sounds become faint and distant, and there is marked shortness of breath.

Treatment: The condition is treated principally by rest in bed and when decompensation develops, by digitalis and similar heart remedies. The tuberculous form is treated in the same manner as other forms of tuberculosis.

HYDROPERICARDIUM

Hydropericardium is a condition in which serum accumulates in the pericardial sac. It is usually associated with accumulation of serum in other cavities, the chest, the abdomen, and with edema, an accumulation of fluid in the tissues.

Cause: The condition usually develops in severe cases of decompensation in heart disease or in chronic nephritis.

Symptoms: The symptoms are those of pericarditis with effusion: pain over the heart area, shortness of breath, a characteristic pulse, distant heart sounds and enlargement of the heart area. When it is caused by decompensation of the heart it is associated with the symptoms of this condition. When it is caused by nephritis the symptoms of nephritis are also present.

Treatment: Hydropericardium is often relieved by treating the primary disease such as decompensation or chronic nephritis. Occasionally the amount of fluid in the pericardial sac is so large

that it has to be withdrawn with a special instrument known as a trocar and canula.

DISTURBANCES IN HEART RATE AND RHYTHM

In certain diseases of the heart the most important manifestation of the disease is a disturbance in the rate and rhythm of heart action. This may occur in organic disease such as myocarditis, endocarditis, or valvular disease, or in functional diseases of the heart.

Physiological Considerations: The contraction of the heart begins in the sinus node with the contraction of the auricles. It is then transmitted to the ventricles along a bundle of fibers running in the septum of the heart, known as the auriculoventricular bundle. The heart action is also modified or controlled by nervous influences, psychical influences, etc. The impulses which reach the heart through the accelerator nerves make the heart beat faster, while those which are transmitted along the vagus nerves make the heart beat slower. The impulses of the accelerator and of the vagus nerves produce the normal changes in pulse rate which occur in emotions, under stress and similar conditions.

When disease of the heart affects the sinus node, the muscle of the auricles or ventricles, or the auriculoventricular bundle, various disturbances in rate and rhythm of the heart result.

The nurse is able to recognize disturbances in rate and rhythm by changes in the pulse, which she should note and record. The physician, however, may determine the nature and origin of disturbances in rate and rhythm by examining the heart with various special instruments such as the electrocardiograph and polygraph.

The Pulse

The pulse is the regular rhythmic impulse which can be felt by applying the finger gently on any of the blood vessels. It is usually felt by placing the index finger lightly over the blood vessel and counting the number of impulses in a minute. The radial artery in the wrist, the temporal artery in the temple or the dorsalis pedis artery on the back of the foot are the usual places for taking the pulse.

The pulse is produced by the regular rhythmic contractions of the left ventricle of the heart, which regularly fills the arteries

about seventy-two times a minute, in a normal person. When the nurse feels the pulse, she is really counting the contractions of the heart. The character of the pulse therefore indicates the force of the heartbeat; but it is modified by the degree of elasticity in the arteries.

When taking the pulse the nurse should note the following points:

1. The rate: the number of beats per minute.
2. The rhythm: whether the beats are regular, whether the interval between beats is prolonged or whether some impulses are weaker than others.
3. The tension: the pressure necessary to compress the pulse.

Types of Pulse

The following are the most common variations in the pulse:

Rapid Pulse: The pulse rate is frequently increased during excitement or when the patient is examined. It also occurs in various diseases which will be described below.

Slow Pulse: A slow pulse is usually an indication of heart disease or disease of other organs. Certain normal persons, however, have a slow pulse for years.

Bounding Pulse: A bounding or full pulse is one in which the artery fills rapidly and empties quickly. The best example of a bounding pulse is the Corrigan Pulse, which occurs in aortic regurgitation of the heart.

Small Pulse: A small pulse is a pulse in which the artery does not fill very rapidly; that is, a pulse without much rebound. This type of pulse occurs in aortic stenosis, narrowing of the aortic valve, or in mitral stenosis, narrowing of the mitral valve. In these diseases an insufficient amount of blood is forced through the valve openings. A small pulse also occurs in ateriosclerosis or hardening of the arteries because the arterial wall is thickened.

Dicrotic Pulse: A dicrotic pulse is a pulse in which a weak impulse is felt between each beat.

Bigeminal Pulse: A bigeminal pulse is a pulse in which every two beats run together.

Trigeminal Pulse: A trigeminal pulse is a pulse in which every three beats come together.

Irregular Pulse: An irregular pulse is a pulse in which the impulses occur at irregular intervals. Sometimes they also vary in strength; some beats are strong while others are weak.

Tense Pulse: A tense pulse is a pulse in which the blood vessel cannot be compressed easily. It usually occurs in high blood pressure and in arteriosclerosis.

DISTURBANCES IN HEART RATE

Disturbances in the rate of heart action may be divided into two groups:

1. Tachycardia, a condition in which the rate is too rapid.
2. Bradycardia, a condition in which the rate is too slow.

TACHYCARDIA

Tachycardia, or rapid heart action, occurs in two forms:

1. Symptomatic Tachycardia.
2. Paroxysmal Tachycardia.

Symptomatic Tachycardia

Symptomatic tachycardia occurs as a symptom of excessive use of stimulants, in infectious diseases, in shock or collapse, in certain diseases of the thyroid gland, in diseases of the heart, and in various nervous diseases.

Stimulants: The excessive use of tea or coffee, alcoholic drinks or tobacco frequently causes a persistent or a temporary rapid heart action, which produces a rapid pulse.

Exercise: After unusual exertion or too strenuous exercise, a rapid pulse rate may persist for a while.

Shock and Collapse: The shock following an operation is usually accompanied by rapid and weak heart action which causes a rapid and weak pulse. In collapse, following hemorrhage, or from prolonged diarrhea, the pulse rate may become very rapid and weak. In progressive hemorrhage the pulse becomes increasingly more rapid and weak in a short time.

Fever: Fever is usually associated with a rise in temperature and a rapid pulse rate which is usually in proportion to the temperature. Thus, a temperature of 103° F. is associated with a pulse of about 120. In some fevers the pulse rate is not in proportion to the temperature. In typhoid fever, for instance, the pulse is slow, especially in the first week of the disease.

Thyroid Disease: Exopthalmic Goiter is characterized by a

marked increase in the pulse rate. The highest pulse rates noted occur in this disease. In decompensation of the heart the pulse rate is frequently rapid.

Nervous Diseases: The heart action is often rapid in certain functional nervous diseases such as neurasthenia or hysteria.

Treatment

The treatment of rapid heart action varies with the cause. As a rule, if the cause is removed, the heart action becomes slower.

Paroxysmal Tachycardia

Paroxysmal tachycardia is a disease characterized by sudden attacks of very rapid heart action frequently associated with palpitation of the heart, excessive perspiration and stomach symptoms. The attacks usually occur at long intervals. The pulse rate suddenly becomes very rapid, sometimes reaching 200. The condition occurs especially in young persons or in those who have some form of heart disease.

Treatment: In most cases no treatment is necessary, as the attack subsides in a very short time. If it does not subside it may be relieved by a drink of ice water or a cup of strong coffee.

The attacks may also be stopped by lowering the patient's head, by pressure on the eyeballs or by pressure on the vagus nerve in the neck.

An enema will sometimes relieve the attack. Adrenalin, digitalis, morphine, chloral hydrate, bromides and similar remedies are often given.

BRADYCARDIA

Bradycardia is a condition in which the heart action is slow, which causes a slow pulse. It occurs as a symptom in jaundice, myxedema, chronic heart disease, digitalis poisoning, in fainting attacks and other conditions.

Jaundice: Jaundice is usually accompanied by a very slow pulse, which is probably due to the presence of bile in the blood.

Myxedema: In myxedema, a condition due to the deficiency of the thyroid gland, the pulse rate becomes very slow, since the effect of the internal secretion of the thyroid is to accelerate the heart action.

Chronic Myocarditis: Chronic myocarditis is frequently

accompanied by a slow pulse. This occurs when the scar formation in the heart involves the auriculoventricular bundle. As a result, the impulses from the auricles are prevented from reaching the ventricles and the ventricles contract in their own inherent rate, which is slower than that of the auricles.

Digitalis Poisoning: The principal poisonous effect of digitalis is a slow pulse. This is the most common cause of a slow pulse in patients suffering with heart disease who have been taking digitalis for some time. When this is noted it should be reported to the physician immediately, and he usually stops the digitalis.

Fainting Attacks: Fainting is a very common condition which occurs especially in women. It may be produced by an emotional shock, the sight of blood or distention of the stomach with gas. The fainting attack usually occurs suddenly; the patient becomes pale and weak and falls down. The pulse is usually very slow and weak. The attack usually lasts a few minutes and the patient recovers immediately.

A fainting attack may be relieved by placing the person flat on the back or lowering the head, or applying pressure above the eyes. A cold drink of water or aromatic spirit of ammonia or whisky is usually given.

DISTURBANCES IN HEART RHYTHM

Disturbances in heart rhythm or cardiac arrhythmias, are changes in the orderly sequence of the contraction of the heart. The disturbed rhythm produces irregular heart action and consequently an irregular pulse.

Cause: The cause may be organic or functional. The organic causes are chronic myocarditis, valvular disease of the heart, arteriosclerosis and the terminal effects on the heart of syphilis. These conditions produce scar formation in the heart, which may destroy or replace some of the heart muscle fibers. As a result the orderly transmission of impulses from the auricle to the ventricle is disturbed and the heart rhythm is changed.

Methods of Recognizing Changes in Rhythm

The changes in heart rhythm may be recognized by the following methods:

1. The pulse.
2. Heart sounds.
3. The Polygraphic tracings.
4. The Electrocardiograms.

Pulse: A disturbance in the rhythm of the heart may be recognized by the changed character of the pulse. The pulse becomes irregular in several ways as follows:

1. Several beats may be missed.
2. The pause between impulses may be prolonged.
3. Weak impulses may be felt between stronger ones.
4. A few rapid impulses may be followed by slower ones.

The physician may recognize various disturbances in heart rhythm by characteristic changes in the heart sounds. It is beyond the scope of this book to discuss these changes in detail.

The Electrocardiogram: The electrocardiograph is a complicated instrument which is used to study the rhythm of the heart muscle contraction. The contraction of the heart muscle produces a very delicate electric current. This current is obtained by placing electrodes on the arms or legs of the patient, or other parts of the body, and connecting them with wires to the electrocardiograph. The current is registered as a curve on a moving sheet of photographic paper. This curve is called an electrocardiogram.

The curve produced by normal heart action is characteristic. The different types of abnormal rhythm of the heart also produce typical curves. The physician is therefore able to determine the exact type of abnormal rhythm by the kind of curve obtained.

Polygraphic Tracings: This is another method for determining the exact type of abnormal rhythm. A polygraph is an instrument which records the heartbeat, the pulse and the filling up of the veins as a curve on a moving slip of paper. The relation of the various curves to one another is characteristic in the normal person. When the heart rhythm is abnormal characteristic changes are produced in these curves.

COMMON TYPES OF ABNORMAL RHYTHM

The most common types of abnormal rhythm are the following:

1. Sinus Arrhythmia.
2. Extra Systoles.
3. Auricular Fibrillation.
4. Auricular Flutter.
5. Heart Block.

Sinus Arrhythmia

Sinus Arrhythmia is one of the most common forms of abnormal heart rhythm. It occurs frequently in children, especially around adolescence. It is characterized by an irregular pulse which occurs especially on respiration. It is not a serious condition and may be relieved by exercise. Some physicians give atropine to relieve it.

Extra Systoles

Extra systoles or premature heartbeats are the most common forms of abnormal heart rhythm. The condition is very common after forty years of age. It may occur in any form of organic heart disease, especially in myocarditis. It is often caused by excessive use of tobacco, tea or coffee. It may be produced by gall-bladder disease or by a distended stomach. It often occurs in the course of infections.

The abnormal rhythm may be temporary or permanent and is characterized by weak irregular heartbeats occurring between the normal stronger beats. The pulse is intermittent or irregular. Some beats are missed or weak impulses may be felt between stronger ones because some of the heartbeats are too weak for the impulse to be felt in the artery.

Treatment: The condition may disappear when the cause is removed, such as the excessive use of coffee or the gaseous distention. When it occurs in nervous patients, bromides are often given. Some physicians order quinidine.

Auricular Fibrillation

Auricular fibrillation is a condition in which the rhythm of the heart is disturbed because certain groups of muscle fibers in the auricle beat independently of the rest of the auricle. This is the most common form of abnormal heart rhythm which occurs in organic heart disease. It is a common cause of decompensation of the heart. It frequently occurs in mitral stenosis or other forms of rheumatic valvular heart disease.

Symptoms: The essential and characteristic symptom is a variation between the heart rate and the pulse rate. Thus, the physician may count a rate of 120 on listening to the heart, but the pulse may be only 100. In other words, some of the heart contractions are too feeble to be transmitted into the blood vessels and cannot therefore be felt when the pulse is taken. The difference between the heart rate and the pulse rate is known

as the **pulse deficit.** The condition is usually more severe when the pulse deficit is large. The heart action is also very irregular; some beats are missed, rapid and slow heart action may occur intermittently and some beats are weaker than others.

Auricular fibrillation is frequently the cause of decompensation of the heart and the patient therefore has shortness of breath, cyanosis, edema, in addition to the characteristic abnormal rhythm.

Treatment: The condition is usually treated by digitalis in sufficient doses to produce a maximum effect. When sufficient digitalis is given, the pulse becomes regular, its rate coincides with the number of heartbeats and the decompensation is relieved.

Heart Block

Heart Block, or Stokes-Adams' Syndrome, is a form of abnormal rhythm characterized by a very slow pulse, usually around 40.

Cause: The disease is produced by interference with the conduction of impulses from the auricle to the ventricle along the auriculoventricular bundle. This is sometimes caused by arteriosclerosis, which interferes with the nutrition of this part of the septum of the heart, or by syphilis, or the terminal stages of syphilis, or by chronic myocarditis with scar formation in the septum of the heart. Heart block is also a characteristic symptom of digitalis poisoning.

The disease occurs in two forms:

1. Partial Heart Block.
2. Complete Heart Block.

Partial Heart Block is a condition in which some of the contractions of the auricle, do not reach the ventricle, hence the ventricles contract at a much slower rate. This causes a slow pulse because the pulse rate is due to the ventricular contraction.

Complete Heart Block is a condition in which no impulses reach the ventricle from the auricle. The auricle and ventricle then beat independently of one another. The ventricle, however, beat much slower than the auricle, and the pulse rate is usually about 40 to the minute.

Stokes-Adams' Disease is a form of heart block characterized by a slow pulse frequently associated with fainting attacks. The fainting is believed to be caused by an insufficient blood supply to the brain as a result of the slow pulse.

Treatment: The treatment varies with the cause. If the

heart block is due to digitalis the condition subsides when the digitalis is stopped. If it is due to syphilis antisyphilitic treatment; mercury, salvarsan, and iodides are given. Atropine is frequently given to increase the pulse rate.

FUNCTIONAL HEART DISEASE

Functional heart disease is a condition in which the patient complains of symptoms referable to the heart, but there is no evidence of organic disease in the heart. It is usually a manifestation of functional nervous disorders in which the nerve mechanism of the heart is disturbed. The symptoms are part of a neurosis and will be described with the various functional nervous diseases in which they occur.

NEURO CIRCULATORY ASTHENIA

Neuro circulatory asthenia is a functional disturbance of the heart action which occurs especially in thin, asthenic, nervous individuals when they are under great mental or physical strain. The disease was especially common during the World War among thin, nervous recruits and it was therefore called "Soldiers Heart."

Symptoms: The symptoms are many and variable and are due principally to disturbed function of the autonomic nervous system. The patient suffers principally from attacks of faintness or exhaustion especially following physical exertion; dizziness, shortness of breath, palpitation of the heart, and a rapid pulse. Some patients complain of actual pain over the heart area. The pain often occurs in attacks resembling angina pectoris, but it is not so marked, nor does it radiate in the usual manner.

Treatment: The condition is treated by rest and elimination of excessive mental and physical exertion. Various sedatives such as bromides, luminal and similar remedies are given. Some physicians advise a rest cure: keeping the patient in bed on a milk or other diet to increase their weight.

THE BLOOD PRESSURE

The blood pressure is the pressure of the blood within the blood vessels. The arterial pressure is the pressure of the blood

within the arteries, while the venous pressure is the pressure of the blood within the veins. The pressure of the blood within the arteries is usually much greater than that in the veins. In practical medicine the physician is concerned principally with the arterial pressure.

Mechanism of Blood Pressure: The blood pressure, or the force with which the blood flows in the arteries, is caused by two factors:

1. The contraction of the left ventricle of the heart.
2. The degree of tension or contraction of the blood vessels.

The force of the contraction of the left ventricle maintains the pressure of the blood current when it is expelled from the heart. The greater the force of the contraction, the higher is the pressure and vice versa.

The width of the small arterioles also regulates the blood pressure. A narrow blood vessel offers a greater resistance to the force of the blood and will therefore increase its pressure. On the other hand, a wider blood vessel will not offer much resistance and the blood pressure will not be so great.

Method of Taking Blood Pressure

The blood pressure is determined by means of an instrument known as a sphygmomanometer. The experienced physician, however, is often able to determine roughly whether the blood pressure is high or low by the tension of the pulse.

There are two forms of sphygmomanometers: a mercury manometer and a spring manometer.

The mercury manometer records the pressure in millimeters of mercury, while the spring manometer measures the pressure necessary to overcome the tension of a spring.

The blood pressure is usually taken by wrapping a flat rubber bag around the arm just above the elbow. The bag is attached to the instrument by means of a rubber tube, and is inflated with air by means of a rubber bulb. The pressure of the air in the bag is then indicated on the mercury column. The bag is then gradually deflated, while the doctor listens at the bend of the elbow with a stethoscope. When the pressure of the air in the bag and that of the blood in the arteries is the same, a sound is heard as the blood begins to flow again into the arteries. The height of the column of mercury at the moment when this sound is first heard is read and recorded and is known as the **systolic pressure.** The bag is then again deflated slowly until this sound

becomes very faint. The point on the mercury column at which this occurs is known as the **diastolic pressure.**

The blood pressure may also be taken without a stethoscope. The bag of the apparatus is applied on the arm and inflated, which obliterates the pulse. When the bag is gradually deflated the pulse returns. The systolic pressure is the point at which the pulse just begins to be felt, while the diastolic pressure is the point on the manometer at which the pulse reaches its maximum bounding quality.

The systolic pressure indicates the maximum systole or contraction of the left ventricle, while the diastolic pressure corresponds to the maximum dilatation or diastole of the left ventricle.

The pulse pressure is the difference between the systolic and the diastolic pressures. It is usually about one-third of the systolic pressure.

Normal Blood Pressure: The normal blood pressure varies with the age and sex of the patient. The blood pressure of women is usually lower than that of men. Children also have lower blood pressures. The average normal ranges for the systolic blood pressure are from about 110 to 135 millimeters, and the diastolic pressure is about two-thirds of that. It is customary to consider the maximum normal blood pressure as 100 plus the age of the patient. For example, the maximum normal blood pressure in a patient at the age of 50 would be 150 millimeters, and in a young man of 20 it would be 120 millimeters, etc.

DISTURBANCES IN BLOOD PRESSURE

Disturbances in blood pressure occur in two forms:

1. Hypertension or increased blood pressure.
2. Hypotension, or low blood pressure.

HYPERTENSION

Hypertension, or high blood pressure, is a condition in which the patient has a higher blood pressure than the normal for his age. The increase may be evident in the systolic pressure, in the diastolic pressure, or in both. The systolic pressure sometimes reaches a very high point, 190 or 200 millimeters or even more.

Hypertension may be divided into two groups:

1. Benign or Symptomatic Hypertension.
2. Essential or Malignant Hypertension.

Symptomatic or Benign Hypertension: The most common form of high blood pressure occurs as a symptom in various diseases: in chronic nephritis, arteriosclerosis, heart disease, hyperthyroidism and exophthalmic goiter. It also occurs at the menopause, in brain tumors, and it may result from focal infections.

In certain forms of chronic nephritis the high blood pressure is an important symptom. The increase in blood pressure is evident both in the systolic and in the diastolic pressure.

Arteriosclerosis is sometimes associated with high blood pressure, especially when the arteriosclerosis involves the brain. The increase occurs both in the systolic and diastolic pressures. The high blood pressure is responsible for many of the complications of the disease such as a "stroke" or hemiplegia.

Exopthalmic goiter and hyperthyroidism are characterized by a marked increase in the systolic pressure, but the diastolic blood pressure usually remains normal or low.

The menopause or change of life is frequently associated with high blood pressure. It is usually a temporary condition, unless other causes are present to account for it, such as chronic nephritis or arteriosclerosis.

Brain tumors are often associated with high blood pressure.

Malignant or Essential Hypertension: Malignant or essential hypertension is an uncommon form of high blood pressure. It occurs in young persons around the age of 20 to 30 who have an hereditary predisposition to the disease. They are usually intensive hard brain workers who lead a strenuous life. Some physicians believe excessive use of tobacco or alcohol are causative factors. The high blood pressure is evident both in the systolic and diastolic pressure. At first these patients suffer only from the hypertension, but as the disease progresses they gradually develop arteriosclerosis and finally chronic nephritis and heart disease. They usually die at an early age of the complications of arteriosclerosis or chronic nephritis.

Symptoms

The principal and diagnostic symptom is the increase in blood pressure, which may reach 200 millimeters or more. This is often the only symptom. Many patients, however, complain of intense headache, especially at night, sleeplessness, ringing in the ears,

numbness in the hands and feet and other symptoms. Sometimes spastic pains occur in the stomach, the abdomen, the heart and other organs. In addition there are symptoms of the associated or causative diseases: arteriosclerosis, nephritis or heart disease or exopthalmic goiter.

Complications: Persistent high blood pressure puts an extra strain on the heart and kidneys and other organs. As a result, chronic heart disease, angina pectoris, arteriosclerosis, or nephritis may develop. When hypertension is associated with arteriosclerosis of the brain, a blood vessel may rupture and a stroke occur. This may cause hemiplegia, paralysis of one side of the body, other forms of paralysis, or sudden death.

Treatment

Prevention: It is advisable for patients with an hereditary predisposition to high blood pressure to avoid overwork, worry, overeating, the excessive use of coffee, tea or tobacco, because these habits tend to raise the blood pressure.

Causative Treatment: In every case of high blood pressure the physician attempts to find the cause and remove it. If focal infections in the teeth, tonsils, sinuses or elsewhere are found, the infected teeth or tonsils are removed and the sinuses are treated. If the cause is hyperthyroidism or exopthalmic goiter or nephritis the blood pressure subsides when these conditions are improved. Hypertension at the menopause is treated by ovarian extracts or corpus luteum given by mouth or by injections, to supply the substances that are deficient at the menopause.

Methods of Reducing Blood Pressure: The blood pressure may sometimes be reduced considerably by keeping the patient in bed. Some physicians order various diets to reduce blood pressure. A salt-free diet or a diet from which proteins such as meats, eggs, and similar foods are eliminated are most commonly used. Recently some physicians have been using diets with high proteins. The intake of water is frequently limited so as to limit the volume of blood. Various fermented milks, especially Bacillus Acidophilus milk, are sometimes given. Warm baths, colon irrigations and various forms of electricity are other methods of treatment.

Remedies: The most commonly used remedies for reducing blood pressure are nitroglycerin, sodium nitrite and other nitrites. Luminal, coal-tar remedies and chloral hydrate are often given to reduce blood pressure. Heparmone, an extract of the liver,

is sometimes tried to neutralize certain poisons which are believed to cause high blood pressure. Large doses of potassium iodide are also frequently given, especially in blood pressure associated with arteriosclerosis. Animasa is a remedy made from the lining of the blood vessels which is sometimes tried.

HYPOTENSION

Hypotension or low blood pressure is a condition in which the pressure of the blood within the arteries is low, usually about 90 or 100 millimeters or less. The condition occurs in two forms:

1. Symptomatic Hypotension.
2. Constitutional Hypotension.

Symptomatic Hypotension: Low blood pressure occurs as a symptom in various acute or chronic infections; in typhoid fever, in severe cases of pneumonia, in anemia, in tuberculosis, heart disease, and in shock or collapse. It is a common and important symptom of Addison's disease, which is usually caused by tuberculosis of the adrenal glands. The lowest blood pressure occurs in this disease; the systolic blood pressure is frequently as low as 60 or 70 millimeters.

Constitutional Hypotension: This is a condition of persistent and permanent low blood pressure. It occurs especially in asthenic persons and in certain forms of obesity.

Asthenic persons are thin individuals with narrow chests, and visceroptosis (falling of stomach, intestines, kidneys, etc.). They are usually very "nervous" and suffer with various stomach symptoms, palpitation of the heart, sleeplessness and other symptoms. They have low blood pressure practically all the time; the systolic pressure is usually around 100 to 110 millimeters. They frequently have a feeling of intense weakness and get exhausted easily.

Constitutional obesity is often associated with persistent low blood pressure. This form of obesity is believed by many physicians to be due to a disease of the pituitary gland, the Froelich syndrome.

Symptoms

The low blood pressure may be the only symptom in many patients. The asthenic and obese patients may have the low blood pressure for years or throughout life. In some patients,

however, the low blood pressure is associated with a feeling of weakness and exhaustion. Some physicians believe this is caused by the low blood pressure. When low blood pressure occurs in infections the toxic symptoms of the infection are also present: a rapid weak pulse, high temperature, prostration and similar symptoms.

Treatment

The methods of treatment depend on the cause. If the low blood pressure is merely a symptom it subsides when the patient recovers from the causative disease such as typhoid fever, anemia, shock, tuberculosis, etc.

In constitutional low blood pressure it is seldom possible to raise the blood pressure appreciably. Physical exercise and overfeeding, with milk and eggs, and methods to improve the general condition of the patient, are usually advised. The remedies used to raise the blood pressure are caffeine, suprarenal extract, ephedrine, heart stimulants and all the usual tonics and stimulants.

CHAPTER XX

DISEASES OF THE BLOOD VESSELS

Physiology of the Blood Vessels

The blood vessels are a series of fine tubes which carry the blood from the heart to the various organs and tissues of the body and back again to the heart. There are three kinds of blood vessels—arteries, capillaries and veins.

The arteries carry the blood from the heart and by numerous subdivisions bring it to every part of the body. The terminal branches of the arteries are called arterioles, which end in still finer vessels known as capillaries. The arteries are made up of three coats: the intima or inner fine serous lining, the media or middle coat which is made up largely of elastic tissue, and contains fine muscle fibers, and an adventitia or outer coat of connective tissue. The capillaries consist only of the intima.

The veins are a system of tubes which bring the blood from the organs and tissues to larger branches and finally by two main branches, the Superior and Inferior Vena Cava, to the heart. They are made up of the same three coats as the arteries, but there is much less elastic tissue in their walls and no muscle fibers. The walls of the veins contain valves which prevent back flow and keep the blood flowing in one direction.

The function of the arteries is to carry the blood from the heart to the various tissues and organs of the body. The blood supply to various organs is often controlled by the caliber of the arteries. When an organ needs more blood the arteries are dilated. When it needs less, the arteries contract and the caliber is diminished. The function of the veins is to bring the impure blood from the organs and tissues of the body to the heart. The capillaries carry the blood within the organs and tissues and join the terminal arteries with the beginning of the veins.

Symptoms of Diseases of the Blood Vessels

Diseases of the blood vessels usually modify their structure. The intima of the vessels becomes roughened and the wall often

becomes thickened and loses its elasticity. The symptoms which result vary according to the disease process and the blood vessels involved.

When the inner lining of the blood vessels becomes roughened there is a tendency for clots to form within the blood vessels. A clot in an artery obstructs the flow of blood, and the organ or tissue supplied by this artery is deprived of nourishment and becomes gangrenous or dies unless it receives blood from neighboring arteries. The destroyed or dead area in an organ is called an infarct.

When a clot forms in a vein it obstructs the return flow of blood. The branches of this vein below the obstruction then become dilated and the neighboring tissues become swollen. The swelling is caused by serum oozing into the tissues from the veins and is called edema. Sometimes the area in the organ from which the vein comes becomes filled with blood and dies and is called a hemorrhagic infarct.

When the elasticity of the arteries is diminished the blood supply to various organs cannot be modified by contraction and dilation of the vessels and various symptoms are produced. For example, in arteriosclerosis of the brain the patient often suffers from sleeplessness because the loss of elasticity in the blood vessels prevents the reduction of the blood content of the brain which occurs during sleep.

When the wall of an artery becomes thickened its lumen is gradually obliterated and the quantity of blood flowing through it becomes diminished. If the arteries in the extremities are affected various symptoms develop such as numbness or tingling, and the hands or feet become cold. Sometimes the walls of an artery are so thickened that the opening in the blood vessel is completely obliterated and gangrene results. In other words the tissues die because they are deprived of blood.

DISEASES OF THE BLOOD VESSELS

Diseases of the blood vessels may affect the arteries, the veins or the capillaries. They may be divided into the following groups:

1. Phlebitis.
2. Thrombosis and Embolism.
3. Aneurysm.
4. Arteriosclerosis.

PHLEBITIS

Phlebitis is an inflammation of the walls of the veins. It occurs in two forms: acute phlebitis and chronic phlebitis.

Acute Phlebitis

Acute phlebitis usually occurs as a complication in various acute infectious diseases: in typhoid fever, pneumonia, or other infections. It frequently develops after childbirth or operations. The veins usually affected are the veins in the groin, but any vein may become inflamed.

Symptoms: The principal symptoms are pain and tenderness over the region of the affected vein. There is usually a slight rise in temperature. Frequently a clot or thrombus forms at the site of the inflammation. When this happens the temperature is somewhat higher, and since this clot interferes with the return flow of blood from the lower extremity, the leg becomes swollen.

Phlebitis usually lasts several weeks, the symptoms gradually subside, but the swelling of the leg may persist for a long time.

Treatment: The patient should be kept completely at rest in bed until all the swelling and pain have subsided. An ice bag is usually applied on the affected vein.

Chronic Phlebitis

Chronic phlebitis is a chronic inflammation of the veins. It usually develops when there is prolonged stagnation of the blood in the veins as in varicose veins. The affected veins become thickned, painful, tender and swollen.

VARICOSE VEINS

Varicose veins are large, thick, dilated, tortuous veins which usually develop when there is continued obstruction along the course of a vein. The veins in the legs are principally affected.

The condition usually results from occupations which require standing for a long time or from the use of tight garters. It also develops when there is pressure on the main veins within the abdomen. This may be caused by a pregnant uterus or a tumor in the pelvis.

Symptoms: The patient often complains of pain in the legs or in the affected veins. The legs or other parts of the body

drained by the varicose veins often become swollen because the return flow of blood is retarded.

Complications: Sometimes a clot forms in one of the veins. The affected vein becomes painful and swollen. Ulcers on the leg are common complications of varicose veins of the leg.

Treatment: A patient with varicose veins should not choose an occupation in which he has to stand continually. Rubber stockings are advised to apply pressure on the veins. In severe cases the enlarged veins are removed by operation. When a clot develops in one of the veins, the patient is kept in bed and an ice bag is applied to the affected vein until the clot is absorbed.

THROMBOSIS AND EMBOLISM

Thrombosis is the formation of a clot in a blood vessel. The clot is called a thrombus.

Embolism is the migration of a clot from the site where it forms to some other blood vessel. The migrated clot is called an embolus.

An infarct is an area in an organ or tissue deprived of blood when an artery or vein is obstructed by a thrombus or embolus.

Cause: The blood does not normally clot in the blood vessels. A clot may develop in one of the blood vessels when its inner lining becomes roughened by disease or by an infection. This occurs in infectious diseases: in typhoid fever, in syphilis, in bacteriemia, in arteriosclerosis or hardening of the arteries and in heart disease.

Pathology: The disease process consists of the formation of a clot in an artery or a vein. The inner lining of the blood vessel first becomes degenerated or roughened as the result of infection of its inner wall. In arteriosclerosis the walls of many of the arteries become thickened and the inner lining becomes roughened. In heart disease a clot may form on the valves because the valve flaps are roughened by an old endocarditis. The clot may remain at the site where it develops as a thrombus, or it becomes loosened and is carried by the circulating blood as an embolus.

When a clot forms in a vein it retards or completely blocks the flow of blood from the area drained by the vein. As a result the serum and blood brought to this area ooze through the walls of the vein into the tissues.

When a clot develops in an artery the flow of blood in the

artery becomes retarded or obstructed. Consequently the organ or tissue to which the artery carries blood is deprived of nourishment. If the neighboring blood vessels can take up the circulation and maintain it, the nourishment of this part of the organ is very soon re-established. On the other hand, if these vessels are unable to maintain blood circulation, the area dies and an infarct is formed. Infarcts are of two kinds: white or arterial infarcts and hemorrhagic or venous infarcts. A white infarct results when an artery becomes blocked. The obstructed artery deprives the affected area in the organ of its blood supply. A hemorrhagic infarct results when a vein becomes blocked. As a result, blood is continually poured into the affected area, but it cannot be drained because the vein is obstructed.

Symptoms: The symptoms vary according to the organ or tissue involved and will be described with the specific forms of thrombosis, embolism or infarct.

Common Forms of Thrombosis and Embolism

The most common organs in which a thrombus or embolus develops are the veins in the groin, the brain, the lungs, the heart, and more rarely, the kidney or spleen.

Femoral Thrombosis

This is the most common form of thrombosis. It occurs especially as a complication in typhoid fever. Phlegmasia Alba Dolens, or Milk Leg, is a form of femoral thrombosis which occurs after labor. It was originally thought to be associated with the formation of milk in the breasts.

Symptoms: The symptoms are essentially pain in the groin, a rise in temperature, and swelling of the leg and thigh. The condition usually subsides in several weeks, but the leg may remain swollen for some time after that.

Pulmonary Embolism

Pulmonary embolism is a condition in which a clot is carried to the lungs and lodges in one of the branches of the pulmonary artery.

Cause: It usually occurs as a complication of bacterial endocarditis or following operations, especially severe abdominal or gynecological operations or operations for varicose veins.

Symptoms: The symptoms depend on the size of the clot and the size of the blood vessel that is blocked. If the clot is a large one, one of the main branches of the pulmonary artery

becomes blocked and the patient dies suddenly with an attack of severe shortness of breath and cyanosis.

If a smaller blood vessel is blocked, the patient complains of sudden pain in the chest. He develops cough, expectoration of blood and shortness of breath and cyanosis. The pulse becomes rapid and sometimes irregular. The symptoms subside gradually in several weeks.

Treatment: When a severe pulmonary embolus develops, all measures are of no avail and the patient dies. Oxygen inhalation, digitalis and various heart stimulants are the remedies given. If the pulmonary embolus is small the patient is kept in bed, completely at rest, usually by morphine. Some physicians order heart stimulants.

Cerebral Embolism and Thrombosis

Apoplexy, or the blocking of one of the main blood vessels in the brain, is one of the most common forms of thrombosis or embolism. It occurs suddenly in arteriosclerosis associated with high blood pressure. It also occurs in the course of bacterial endocarditis and in other valvular heart disease, especially mitral stenosis.

Symptoms: The symptoms vary according to the blood vessel which becomes blocked. When an artery in the motor area is blocked a hemiplegia results. This is a paralysis of an arm and leg and sometimes the face, on one side of the body. The side affected is usually opposite to that of the location of the clot. If the paralysis occurs on the right side the patient also loses his speech. When an artery at the base of the brain is blocked sudden death may result.

Coronary Thrombosis

Coronary thrombosis is a condition in which a branch of the coronary artery is blocked by a thrombus or embolus. It occurs in arteriosclerosis of the coronary arteries and in chronic heart disease.

Symptoms: The symptoms depend on the artery affected. If a main branch of the coronary artery is blocked, a large area of heart muscle is deprived of nutrition and the patient dies suddenly. If a smaller artery is obstructed, the patient complains of a sharp pain over the heart area extending up to the shoulder. The pain is similar to a severe attack of angina pectoris, but the attack lasts for a long time. The patient has marked shortness of breath, cyanosis and sometimes a charac-

teristic pallor. The physician often hears a "friction rub" on listening to the heart. When the patient recovers from the attack a permanent disturbance in heart rhythm or other form of heart disease develops.

Treatment: The patient is kept in bed and sometimes an ice bag or hot-water bag is applied over the heart area of the chest. Morphine or other sedatives are given to relieve the pain. Nitrites, nitroglycerin, diuretin or euphyllin are the remedies usually given.

Mesenteric Thrombosis

Mesenteric thrombosis is a condition in which a branch of the mesenteric arteries or veins, the blood vessels of the intestines, becomes blocked by a thrombus or an embolus. The obstruction in the blood vessel causes gangrene or an infarct of part of the intestine.

Symptoms: The symptoms are those of intestinal obstruction, abdominal pain, nausea and vomiting and shock. In addition, the stools contain blood.

Treatment: The condition is treated by an operation for the removal of the gangrenous intestine.

Splenic Embolism

An embolus in the spleen frequently occurs in the course of various acute infections, especially septicemia or bacteriemia. It causes an infarct or gangrenous area in the spleen.

Symptoms: The principal symptoms are sudden pain and tenderness in the left side of the abdomen, associated with chills and a septic temperature.

Embolism in the Kidney

An embolus in the kidney occurs in several forms, as follows:

1. A large infectious embolus sometimes occurs in the cortex of the kidney and is called carbuncle of the kidney.
2. Acute embolic nephritis.

Carbuncle of the kidney frequently causes severe septic temperature, with pain and tenderness over the kidney region. It sometimes forms an abscess around the kidney (perinephritic abscess).

Acute embolic nephritis is a form of acute nephritis characterized by the formation of small emboli in the glomeruli of the kidney. The symptoms are principally those of acute nephritis:

pain in the kidney region, slight temperature and albumin and blood in the urine.

Treatment of Thrombosis and Embolism

It is essential for every patient who has had an operation for varicose veins, hemorrhoids or serious abdominal operations, to remain in bed for a sufficiently long time. This allows good healing and prevents the clots in the wound or blood vessels from becoming loose. When an embolus or thrombus occurs the patient should be kept in bed with an ice bag over the affected region. The subsequent treatment depends on the organs involved and is described under the specific diseases.

ANEURYSM

Aneurysm is dilatation of a blood vessel or the protrusion of part of its wall. It occurs in several forms as follows:

1. Fusiform Aneurysm.
2. Sacculated Aneurysm.
3. Dissecting Aneurysm.
4. Arteriovenous Aneurysm.

A Fusiform Aneurysm is a dilatation or widening of part of a blood vessel.

A Sacculated Aneurysm is a small protrusion of part of the wall of a blood vessel.

A Dissecting Aneurysm is widening or thickening of a portion of a blood vessel as the result of a hemorrhage between the various coats of the blood vessel.

An Arteriovenous Aneurysm is a small sac which communicates between an artery and a vein.

Aneurysms may occur in the arteries or veins. They may be large or small. The most common location for a large aneurysm is in the arch of the aorta and the popliteal artery in the back of the leg. Small aneurysms frequently occur in arteriosclerosis, in the blood vessels of the brain, or in other organs.

Cause: The most common cause of aneurysm is syphilis or arteriosclerosis. Arteriovenous aneurysm is usually caused by an injury, such as a bullet wound, which pierces an artery and a neighboring vein.

Pathology: When syphilis affects the walls of the blood vessels the affected areas become friable. The pressure of the blood in the vessels therefore causes dilatation of the affected areas. If only one spot is affected then the increased pressure may

cause this part of the blood vessel to protrude, forming a sacculated aneurysm.

A dissecting aneurysm is caused by a rupture or softening of a spot on the inner lining of the arteries. The blood oozes through this area, a clot forms between the walls of the artery, and the affected part gradually becomes dilated.

In arteriosclerosis portions of the arteries and veins become firm and thickened. This reduces the elasticity of the affected arteries and causes bulging in certain areas, with the formation of small aneurysms.

Symptoms: The symptoms of an aneurysm depend on its location and are principally pain, the formation of a mass which pulsates, and the symptoms of pressure on surrounding structures.

Complications: The most common complication of an aneurysm is hemorrhage. The bleeding may be slight or so severe that the patient may bleed to death. Hemorrhages from small aneurysms in the brain are quite common and may cause various forms of apoplexy, such as hemiplegia, paralysis, blindness and even sudden death.

Treatment: The methods of treatment are causative, symptomatic and surgical.

If an aneurysm is due to syphilis it is treated by the usual antisyphilitic remedies. When causative measures are not effective, or until they are effective, the symptoms are relieved by the usual remedies. For pain, sedatives are given, or local applications such as heat or electricity are used. If decompensation of the heart develops as in aneurysm of the aorta, the patient is treated like any other form of heart disease. Surgical methods are only useful in aneurysm of the carotid artery in the neck or in aneurysm in blood vessels in the extremities. The affected blood vessel is tied either above or below the aneurysm. The neighboring vessels become enlarged and bring blood to structures which were formerly supplied through the aneurysm.

ANEURYSM OF THE AORTA

Aneurysm of the aorta is the most common form of large aneurysm. The arch of the aorta is usually affected at its origin, at the base of the heart. The aneurysm may be fusiform or sacculated.

Symptoms

The symptoms of aneurysm of the aorta may be divided into four groups: aortic, heart, pressure and causative symptoms.

Aortic Symptoms: The earliest and principal symptoms of aneurysm of the aorta are pain and widening of the aorta. The pain is usually situated directly under the sternum and often resembles angina pectoris, radiating to the shoulder. The widened aorta can be recognized by the physician by various methods of examination. Sometimes the aneurysm bulges through the sternum and may be felt as a pulsating mass. The X-ray examination of the heart will show the widened aorta.

Heart Symptoms: As the aneurysm increases in width it stretches the aortic opening of the heart and produces a valvular defect in the aortic valves. The valves cannot close completely and aortic regurgitation develops. To overcome this defect the heart becomes enlarged and the wall of the left ventricle becomes thickened. Decompensation attacks often develop as the result of extra strain and the patient may then develop shortness of breath, cyanosis, and edema of the extremities.

Pressure Symptoms: The enlarged aorta presses on neighboring structures and produces various symptoms. The face may become flushed on one side or one pupil is dilated, due to pressure on the sympathetic nerves. Hoarseness or a characteristic brassy voice and cough sometimes develop from pressure on the recurrent laryngeal nerve (the principal nerve of the vocal cord). A pulling sensation is sometimes felt on the larynx.

Causative Symptoms: Aneurysm of the aorta is usually due to syphilis and the blood examination will often give a positive Wassermann reaction. The patient often shows other evidences of syphilis such as irregular shaped pupils, headache, disturbed gait, diminished knee jerks, etc.

Treatment

Aneurysm of the aorta is treated by medical and surgical methods. The medical treatment may be divided into three parts, as follows:

1. Treatment of syphilis.
2. Symptomatic treatment.
3. Treatment of decompensation.

Causative Treatment: When aneurysm of the aorta is found to be due to syphilis, salvarsan, mercury, bismuth and iodides are the remedies used. The treatment is principally effective in the early stages.

Symptomatic Treatment: The pain is often quite severe and is usually treated by various sedatives such as luminal, allonal, aspirin, pyramidon, morphine or codeine. Hot applications

are useful; cupping and mustard plasters are various local applications often used. When the blood pressure is high, nitrites or nitroglycerin are given.

Treatment of Decompensation: When decompensation develops the patient is kept in bed and treated like any other heart case. Digitalis and other heart remedies are ordered.

Surgical Treatment: Aneurysm of the aorta is sometimes treated by a serious surgical operation. A loop of fine gold wire is inserted into the wall of the aneurysm. It acts as a foreign substance which stimulates the formation of a clot. The clot gradually becomes changed to connective tissue and makes the wall of the aneurysm much thicker.

AORTITIS

Aortitis is an inflammation of the wall of the aorta. It occurs in two forms, acute or chronic. Acute aortitis is very rare and is sometimes caused by acute rheumatic fever. Chronic aortitis is more common and is usually due to syphilis.

Pathology: The inflammatory or syphilitic process in the wall of the aorta causes gradual stretching and dilatation of its wall. In the chronic form this sometimes occurs to such an extent that an aneurysm develops.

Symptoms: The symptoms are principally pain over the sternum, radiating into the arms, cough, and sometimes shortness of breath. The X-ray examination may show the enlarged aorta. When the dilatation is extensive the aortic valves become defective and aortic regugitation and sometimes decompensation of the heart may develop.

Treatment: The acute form is treated by rest in bed, salicylates and sedatives for the pain. The chronic form is treated by the usual antisyphilitic remedies. When decompensation develops it is treated in the usual manner.

ARTERIOSCLEROSIS

Arteriosclerosis or hardening of the arteries is one of the most common diseases of the blood vessels. Sometimes only a few blood vessels in various parts of the body are affected, but usually many vessels throughout the body are involved.

Cause: The disease is frequently a natural change of advanc-

ing years; as a person gets older the walls of the blood vessels gradually become thickened. It may, however, occur around middle life and occasionally in young persons. It occurs especially in persons who have an hereditary predisposition, that is, whose parents or grandparents had arteriosclerosis. The disease is more common among intensive hard brain workers who lead a strenuous life and among those under constant mental stress and strain. It frequently develops in painters, typesetters and others who are exposed to lead poisoning and among gouty persons. Persistent high blood pressure is often followed by arteriosclerosis. Chronic infections such as syphilis or the continual absorption of pus from infected teeth, sinuses or other regions, or the excessive use of tobacco or alcohol are other causative factors.

Pathology: The disease process begins with degenerative changes in the lining and wall of the blood vessels. The degenerated areas are gradually replaced by connective tissue. As a result the blood vessels lose their elasticity and become thickened. The lining of the blood vessels becomes roughened and there is a tendency to hemorrhage and clot formation within the blood vessels. As a result of progressive thickening the walls of some of the blood vessels become so narrow that very little blood can flow through them. In severe long standing cases calcium or lime salts are deposited in the walls of the blood vessels. The lime deposits are sometimes so extensive that some of the arteries become changed to a thick firm tube resembling the stem of a clay pipe, hence they are sometimes called "pipe stem" vessels. The arteriosclerotic process affects principally the arteries and arterioles. Sometimes the veins are also affected, a condition known as phlebosclerosis.

Symptoms

The symptoms may be divided into two groups: primary and secondary symptoms.

Primary Symptoms

The chief primary symptom is evidence of thickened blood vessels, which may be noted when the pulse is felt. Sometimes the blood vessels are so thick and firm that they feel like the stem of a clay pipe and are called pipe-stem vessels. The blood vessels in the temple may appear tortuous or twisted. Arteriosclerosis is usually associated with high blood pressure and the

physician will therefore find an increase in blood pressure. In some cases, however, the blood pressure may be normal, or even low.

Secondary Symptoms

The secondary symptoms are due to the disturbance in the function of various organs which results when their blood vessels become thickened and cannot therefore maintain an adequate circulation. The organs principally involved are the heart, the kidneys, the brain, various organs in the abdomen, and the extremities.

Cardiac Symptoms: The thickening of the walls of the blood vessels, especially when associated with high blood pressure, puts an unusual strain upon the heart. The left ventricle of the heart then becomes thickened and the heart gradually becomes enlarged. When the patient is under unusual strain, an attack of decompensation will often develop with shortness of breath, cyanosis and edema.

When arteriosclerosis involves the coronary vessels of the heart the patient may develop attacks of angina pectoris with pain over the heart area, extending into the arm.

Kidney Symptoms: The thickened blood vessels in the kidneys gradually produces chronic nephritis, with the usual symptoms of this disease: diminished secretion of urine, the presence of albumin and casts in the urine, edema or swelling of the extremities, and evidence of disturbed kidney function.

Brain Symptoms: Arteriosclerosis of the blood vessels in the brain may cause permanent or transient disturbances in the circulation. The symptoms may be divided into temporary and persistent symptoms.

The temporary symptoms are dizziness, attacks of headache, sometimes weakness in one arm or leg, or in an arm and leg together.

The persistent symptoms are persistent headache, which is usually a sense of tightness around the head or continued sleeplessness or dizziness.

Abdominal Symptoms: Abdominal symptoms are common in arteriosclerosis. Many patients get indefinite pains or cramps in the abdomen, usually in the stomach or in the intestines. The pains are sometimes very severe and may be associated with diarrhea and constipation. Arteriosclerosis of the pancreas is often the cause of diabetes in old people.

Symptoms in Extremities: Arteriosclerosis often affects the

blood vessels in the arms and legs; the legs are usually involved more than the arms.

The symptoms are numbness, tingling and pain in the fingers, toes, hands, or feet.

When the arteriosclerosis involves the blood vessels in the muscles of the legs attacks of severe cramplike pains occur in one or both calves, especially on walking or during exercise. This condition is called intermittent claudication.

Complications

The complications of arteriosclerosis result when a blood vessel is completely obliterated or when it becomes obstructed by a clot or thrombus or an embolus. The most common complications are apoplectic attacks or "strokes," and gangrene.

Apoplexy: Apoplexy or a stroke occurs when a blood vessel in the brain is blocked by a thrombus or embolus. If a blood vessel in the motor area of the brain is blocked or ruptured the patient suddenly develops a complete paralysis of one side of the body which is called hemiplegia. When a blood vessel at the base of the brain or if a large blood vessel becomes blocked or ruptured sudden death may result.

Gangrene: In severe cases, especially in old people, the arteries in a toe or foot may become blocked completely. The toe or foot is therefore deprived of blood and becomes gangrenous.

Coronary Thrombosis: In arteriosclerosis of the coronary arteries, the blood vessels in the heart, a clot often blocks one of the branches. As a result part of the heart is deprived of blood, and the patient may die suddenly or develop a severe attack of angina followed by a permanent disturbance in rhythm.

Treatment

Arteriosclerosis is treated by preventive measures, removing the cause, a suitable diet, proper hygiene and various remedies and measures to relieve the symptoms.

Prevention: It is essential for persons in whom there is an hereditary predisposition to arteriosclerosis to regulate their life and avoid those factors and excesses which tend to develop the disease, such as mental strain, overwork, overeating, and the excessive use of alcohol and tobacco. They should choose an occupation with a minimum amount of nervous tension, and they should learn to relax and take mild outdoor exercise frequently. In short, they should take life easy.

Causative Treatment: The physician always treats any focus of infection because absorption of poisons from teeth, tonsils, sinuses and other organs may be important factors in causing arteriosclerosis. When there is evidence of syphilis, large doses of potassium iodide, mercury or salvarsan are given.

Diet: The diet usually advised contains limited quantities of food and is low in proteins and salts. Many physicians use fermented milks, such as Bacillus Acidopholus milk, since the lactic acid forming bacilli check the growth of many of the bacteria present in the intestines. Some physicians believe that arteriosclerosis is often caused by continual absorption of poisons from the intestine. Recently some physicians have been using diets containing large amounts of proteins.

Hygiene: Patients suffering with arteriosclerosis should eat moderately, avoid the excessive use of alcohol and tobacco and should move their bowels regularly. They should take light exercise frequently and should get plenty of sleep. Above all they should avoid worry and undue nervous excitement and tension.

Remedies: There are no remedies that can cure arteriosclerosis. Potassium iodide is frequently given to absorb the scar tissue in the walls of the blood vessels. When the blood pressure is high, nitroglycerin or other nitrites, luminal or chloral, are frequently ordered.

Symptomatic Treatment: The headache, sleeplessness, dizziness and other symptoms caused by arteriosclerosis of the brain are treated by sedatives such as allonal, luminal, veronal and by nitrites. The attacks of angina are treated like other attacks of angina, by nitrites or nitroglycerin, atropine, and similar remedies. The attacks of abdominal pain and pains in the extremities are treated by the same remedies.

Treatment of Complications: A stroke or hemiplegia is treated in the same manner as a stroke from any other cause. The gangrene is treated surgically, usually amputation of the affected limb is necessary.

THROMBO ANGITIS OBLITERANS

Thrombo angitis obliterans is a chronic progressive disease of the arteries which affects particularly the feet and hands and produces gangrene.

Cause: The cause of the disease is unknown, but it occurs especially among Russian Jews. Some physicians believe exces-

sive cigarette smoking, increased blood sugar or a disturbance in the blood salts to be causative factors.

Pathology: The disease is characterized by progressive thickening of the arteries in the feet and hands. This gradually obliterates the blood vessels and causes gangrene of one or several toes or fingers or of an entire foot or hand.

Symptoms

The earliest symptoms are severe shooting pains in the toes and feet or in the fingers and hands. The pains steadily increase in severity and are usually worse at night. Gradually the toes, feet or hands become purple or blue in color. They are cold and clammy and are very sensitive to heat and cold. The pulsation in the arteries of the affected feet or hands and for some distance above them gradually becomes lessened and is finally obliterated completely. As the disease progresses one or several toes, an entire foot, or several fingers or an entire hand, become gangrenous. The disease frequently progresses even after amputation and the stump of a leg or a forearm continues to develop gangrene.

Treatment

The disease is treated by medical or surgical methods.

Medical Treatment: The patients are usually advised to limit the quantity of food, to give up cigarette smoking and stimulants such as alcohol, coffee or tea. The most common methods of treatment are injections of various salt solutions. The entire intestinal tract is often flushed out daily with several quarts of normal salt solution. A 5% sodium chloride solution or a 2% solution of sodium citrate is frequently given by intravenous injection, usually about 300 to 500 cc. at a time. X-ray treatment applied to the leg or to the spine is sometimes very beneficial. Baking and other forms of physical therapy are used.

Surgical Treatment: When the pain is very severe the nerves of the affected foot are often injected with alcohol to relieve the pain. When gangrene develops the affected toe, foot, or hand is usually amputated. Sometimes an entire leg has to be amputated even if the gangrene only involves several toes because the arteries may be obliterated for some distance above the affected part.

CHAPTER XXI

DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS

Physiology of the Blood

The blood is a characteristic red fluid which circulates within the blood vessels: the arteries, capillaries, and veins. It consists of a straw-colored fluid, the plasma or serum, and numerous microscopic cells called corpuscles.

Plasma: The plasma is a straw-colored fluid which contains numerous dissolved substances: proteins, sugar, fat, and salts of calcium, sodium, magnesium and potassium, in the form of phosphates, chlorides, and sulphates. It also contains numerous antibodies or antidotes against infections. The antibodies have not yet been isolated, but their presence in the blood is known by the reaction of the blood to infections. They have already been discussed under infectious diseases.

Corpuscles: The corpuscles are small microscopic cells which occur in two forms: red corpuscles and white corpuscles. There are also tiny bodies called blood platelets. The blood contains about five million red corpuscles per cubic millimeter, about ten thousand white corpuscles and about two hundred thousand platelets per cubic millimeter.

The red corpuscles or red cells are tiny microscopic concave disks without nuclei. They contain a complex protein combined with iron known as hemoglobin, which gives the blood its red color. The hemoglobin takes up oxygen from the lungs and carries it to the tissues and organs of the body.

The white corpuscles or leucocytes are somewhat larger cells and contain nuclei and granules. They are divided into several groups according to the shape of the nuclei, the size of the granules and in the manner in which they stain with various aniline dyes, as follows: polynuclear leucocytes, lymphocytes, mononuclear cells and eosinophiles.

Polynuclear leucocytes are white blood cells with several nuclei. The body of the cells stains red with certain dyes and

contains numerous fine granules. About 75% of all the white blood corpuscles are polynuclears.

Lymphocytes are small cells with a single nuclei and the entire cell and nucleus stains blue with certain aniline dyes. They are sometimes divided into small and large lymphocytes.

Mononuclear cells are large cells containing nuclei which almost fill up the entire cell.

The lymphocytes and mononuclear cells constitute about 23% of all the white blood corpuscles.

Eosinophiles are large cells with multiple nuclei. The body of the cell contains deeply staining granules. They constitute only one or two per cent of the white blood corpuscles.

The blood platelets are tiny microscopic cells much smaller than any of the white blood corpuscles.

Abnormal Forms of Corpuscles: In certain diseases of the blood unusual forms of corpuscles occur.

The red blood cells are sometimes very large and are called megalocytes. Microcytes are tiny, small red blood cells. Normoblasts are red blood corpuscles containing nuclei. These are blood cells which enter the blood from the bone marrow before they have lost their nuclei. Megaloblasts are large red cells containing nuclei. Poikilocytes are irregular shaped cells. Myelocytes are abnormal forms of large white corpuscles containing peculiar granules or no granules at all.

Blood Clotting: The blood has the peculiar property of changing from a fluid consistency to a semi-solid gelatinous mass. This property is known as clotting and the mass of blood which is formed is called a clot.

The blood is very essential to life; death results if a large quantity is lost. The formation of a clot in the opening of a blood vessel prevents a serious loss of blood.

When blood clots it separates into two parts: a dark red jelly-like clot and a clear straw-colored fluid, the serum. The clot contains red and white blood corpuscles held together by a network of fibrin. Normally the fibrin is dissolved in the blood and only develops into a network when clotting takes place. In order to clot the blood must contain calcium salts, dissolved fibrin, and a normal quantity of blood platelets. The blood only clots when it comes in contact with any substance or tissue other than a normal blood vessel. The blood will not clot if any of the factors essential for clotting are absent.

Function of the Blood: The function of the blood is to provide nourishment for the tissues and organs of the body, to

remove their waste products, to circulate the internal secretion of various ductless glands, such as the secretion of the thyroid gland, insulin, etc., to neutralize poisons and to overcome infectious diseases.

The function of the red blood corpuscles is to provide oxygen to the cells of the organs and tissues of the body. The oxygen is carried by the hemoglobin of the red cells and is obtained from the air sacs in the lungs. The tissues take up the oxygen and replace it with carbon dioxide, a waste product which results from the activity of the cells. The red cells then carry the carbon dioxide back to the lungs, where it is eliminated with the expired air.

The function of the leucocytes or white blood corpuscles is to overcome infections and to act as scavengers. They surround bacteria and other foreign substances in the blood or tissues and destroy them.

The leucocytes usually increase in number whenever any infection is present in the body and in certain blood diseases. Various infections often cause an increase or diminution in the specific type of leucocytes. Thus, an ordinary pus infection increases the number of polynuclear leucocytes. Typhoid fever diminishes the number of the leucocytes; tuberculosis may cause an increase in the lymphocytes, and intestinal parasites increase the number of eosinophiles.

The function of the blood platelets is associated with blood clotting. The blood platelets are diminished or increased in diseases characterized by a disturbance in the clotting power of the blood.

Blood Formation: The serum of the blood is formed from the digested food which finally enters the blood vessels from the intestinal tract. The hemoglobin of the blood is formed principally in the liver. The blood corpuscles are formed principally in the bone marrow, where they contain nuclei, which are lost before they enter the blood stream. Some of the white corpuscles are also formed in the spleen. In some diseases of the blood, as in pernicious anemia, the red blood corpuscles enter the blood before losing their nuclei. Consequently the blood in these diseases contains many nucleated red blood corpuscles.

Blood Destruction: The waste products of the blood are eliminated by the kidneys, in the urine; by the skin, in the perspiration; and by the lungs, in the expired air. The kidneys and skin eliminate water and salts. The lungs eliminate carbon dioxide. The red blood corpuscles are destroyed by the spleen and liver.

Hemolysis: Hemolysis, or blood destruction, is a term generally used to indicate destruction of red blood corpuscles. When the blood of an animal of one species is injected into an animal of another species the injected corpuscles will be destroyed. This is known as hemolysis. Similarly when the blood of one person is injected into another the injected corpuscles may be destroyed. Persons whose blood will mix without destroying each other's corpuscles are considered to belong to the same blood group. There are four different blood groups and only the blood of persons belonging to the same group are compatible. The group to which a patient belongs is determined by special tests before every blood transfusion. The transfusion can be successful only when the patient and the donor belong to the same group, otherwise hemolysis results.

Methods of Examining Blood

The diseases of the blood are usually recognized by examining the blood by microscopic, chemical, bacteriological and immunological methods.

Microscopic Examination: The number of red and white blood corpuscles in the blood is counted by special microscopic methods. The percentage of the different types of cells and the presence of abnormal forms of cells is determined by staining a smear of blood on a slide with various dyes and examining the slide under the microscope. The presence of parasites, such as malarial parasites, may also be determined by this method.

The percentage of hemoglobin in the blood is determined by various methods which consist of comparing the color of the blood with standard colors produced by definite percentages of hemoglobin.

Chemical Examination: The blood is often examined by various chemical methods to determine the presence of abnormal constituents or the increase or diminution in normal constituents such as urea, uric acid, sugar, salts, etc.

Specific Examinations: The clotting time, the time it takes the blood to clot, is determined by special methods of examination. The bleeding time, that is, the time the blood continues to bleed, is determined by other methods.

Bacteriological Examination: The blood is often examined by various bacteriological methods to determine whether various bacteria are present in the blood.

Immunological Examination: The diagnosis of certain diseases is often made by various blood tests which determine the

presence of specific antibodies or other substances in the blood. The Widal test for typhoid or the Wassermann tests for syphilis are the most common tests of this kind.

BLOOD CHANGES IN DISEASE

There are certain diseases which are characterized by changes in the blood constituents. They may be divided into two groups: symptomatic changes and blood diseases.

Symptomatic Changes: The constituents of the blood are often changed in various diseases, and these changes are merely symptoms of the disease. Thus in diabetes the blood sugar is increased; in nephritis the percentage of urea, uric acid and creatinin is increased. In syphilis the blood gives a positive Wassermann reaction, in typhoid fever a positive Widal test, etc.

Blood Diseases: Diseases of the blood are diseases which are characterized by the presence of abnormal constituents in the blood or by a change in the normal constituents. They may be divided into two groups: (1) Infectious Diseases, (2) Diseases of the Blood and Blood-forming Organs.

The infectious diseases are diseases characterized by the presence in the blood of bacteria or other parasites or their toxins. Typhoid fever, malaria, syphilis and the other infectious diseases are diseases of this character. They have already been described.

DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS

The diseases of the blood and blood-forming organs are characterized chiefly by a change in the corpuscles of the blood or in some of the functions of the blood such as clotting. They may be divided into the following groups:

1. Hemorrhage.
2. Diseases affecting Red Blood Corpuscles.
3. Diseases affecting White Blood Corpuscles.
4. Diseases affecting Blood Platelets.
5. Diseases affecting Blood Clotting.

HEMORRHAGE

Hemorrhage is a loss of blood. The bleeding may be a sudden loss of a large quantity of blood or a progressive and continuous loss of small quantities.

Cause: The cause of hemorrhage may be in the blood vessels or in the blood itself. An opening in an artery, vein or capillary causes bleeding in proportion to the size of the opening. The bleeding from a capillary is usually small in amount and is a continual oozing. In a normal person bleeding stops by the formation of a clot over the opening in the blood vessel. Hemorrhage sometimes occurs when the blood is unable to clot and keeps pouring out or oozing continually for hours or days.

Symptoms

The symptoms may be divided into local and general symptoms.

Local Symptoms: The local symptoms occur at the time of bleeding and are principally the flow of blood at the site of injury, and pain. The bleeding may occur in a wound or in a hollow organ, such as the uterus or stomach or in the lungs. When it occurs after an operation the dressings are saturated with blood. Internal hemorrhage occurs into the abdomen from a ruptured spleen, Fallopian tube or large blood vessel or in other regions where the site of bleeding cannot be seen. When bleeding occurs in the stomach or intestines the blood may not be evident until the patient vomits or the bowels move.

The character of the bleeding depends on the blood vessel from which it occurs. When an artery bleeds the blood is usually bright red in color and comes out in spurts. The blood from a vein is darker in color and appears as a steady flow. The bleeding from capillaries is usually a continuous oozing of small quantities of blood.

Bleeding is also modified by the organ from which it occurs. In hemorrhage from the lung the blood is bright red and frothy. The blood of a hemorrhage in the stomach is dark brown in color, resembling coffee ground and is only evident when the patient vomits. An intestinal hemorrhage is evident by dark brown clots or black stools which occur several hours after the bleeding has taken place.

Secondary or General Symptoms: The secondary or general symptoms only develop when the patient has lost a large amount of blood. The pulse becomes steadily more rapid and weak. The patient complains of thirst and the skin becomes pale, cold and clammy; the breathing becomes shallow and finally the patient gasps for air, a condition known as air hunger. If the hemorrhage is not stopped the pulse gradually disappears and the patient may die.

When a large amount of blood is lost, either suddenly or gradually, the patient becomes anemic, the skin is pale, the percentage of hemoglobin and the number of red blood cells are diminished.

Treatment

Hemorrhage is treated by stopping the bleeding, removing the cause, and treating the after effects.

Methods of Checking Hemorrhage: First aid in hemorrhage consists of stopping bleeding. Bleeding from a large blood vessel can be stopped by applying a tourniquet. If the blood comes from an artery the tourniquet is applied above the bleeding point, while if the blood comes from a vein the tourniquet is applied below the bleeding spot. If the bleeding is continual or if arterial or venous bleeding occurs in a region where a tourniquet cannot be applied it may be stopped by applying pressure with sterile gauze. When the physician arrives he ties the bleeding blood vessel or applies pressure if he cannot tie it. Sometimes hemorrhage can only be checked by an operation. For example, a ruptured ectopic is a pregnancy in one of the Fallopian tubes and often causes severe abdominal hemorrhage. An immediate operation is necessary to check the hemorrhage by removing the affected tube.

Nursing Care: The nursing in hemorrhage is very important. The patient is usually kept flat on the back and the foot of the bed is elevated. The body is kept warm by numerous blankets, hot-water bags or electric pads. The patient is kept quiet by means of morphine or opium. If the site of the hemorrhage cannot be reached, for example, in the stomach or intestine, an ice bag is applied on the abdomen.

After Care: When the patient has lost a large amount of blood a transfusion is done to replace the blood lost and to stimulate clotting. If it is impossible to do a transfusion and before a donor can be obtained, normal salt solution is given intravenously or by hypodermoclysis to replace the blood lost and maintain heart action.

The anemia following hemorrhage is treated by special diets, iron and arsenic preparations, and the severe forms by transfusion. When bleeding continues or occurs in internal organs, such as the lungs, stomach or intestines, horse serum, thromboplastin and similar substances are given to increase clotting.

The treatment of hemorrhage from special organs is described under the diseases of the various organs.

DISEASES AFFECTING RED BLOOD CORPUSCLES

The diseases characterized by changes in the red blood corpuscles are of two kinds:

1. Anemia, a disease or condition in which the red blood corpuscles and hemoglobin are diminished.
2. Polycythemia, a disease characterized by an increase in the red blood corpuscles.

ANEMIA

Anemia is a disease characterized by a reduction in the number of red blood corpuscles and the percentage of hemoglobin in the blood and occurs in the following forms:

1. Secondary Anemia.
2. Chlorosis.
3. Pernicious Anemia.

SECONDARY ANEMIA

Secondary anemia is the most common form of anemia and results from various specific causes. It may occur as an acute or sudden anemia or develop gradually as a chronic form.

Cause: The most common cause of secondary anemia is hemorrhage. Acute anemia may result from a sudden loss of blood after an injury or operation or from a bleeding typhoid ulcer or a duodenal or gastric ulcer. Chronic or gradual anemia results from continued small hemorrhages such as sometimes occur in a bleeding ulcer of the stomach or in hemorrhoids. Anemia also develops in certain infectious diseases: rheumatism, scarlet fever, tuberculosis and syphilis, and in chronic nephritis or cancer.

Symptoms

The symptoms may be divided into blood changes and clinical symptoms.

The blood changes are a reduction in the number of red blood cells and in the percentage of hemoglobin. In severe cases the red blood cells are markedly reduced and the hemoglobin is very low and various abnormal forms of cells occur.

The clinical symptoms are pallor of the mucous membranes and the skin, weakness, palpitation of the heart, shortness of

breath, headache and dizziness. They are due to the poor condition of the blood.

Treatment

Secondary anemia is treated by removing the cause and by a diet and medicines to increase the red blood corpuscles and the percentage of hemoglobin.

When the anemia is due to hemorrhage, it often improves spontaneously when the hemorrhage is stopped. When it is due to infections such as rheumatism, tuberculosis, syphilis or other infections, the anemia may improve when the infection subsides.

It has recently been proven that anemia can be greatly benefited by a diet rich in blood-forming substances and iron. Consequently patients are given liver, bone marrow, meats, eggs and vegetables.

The most common remedies for anemia are iron and arsenic. They are given by mouth or hypodermically.

In severe anemia, especially following hemorrhage, blood transfusions are often given.

The effect of treatment is indicated by the general improvement in the patient's condition and the increase in the number of red blood corpuscles and the percentage of hemoglobin.

CHLOROSIS

Chlorosis or green sickness is a disease of young adolescent girls characterized by severe anemia. The disease was formerly quite prevalent, but its incidence has been greatly reduced in the last decade or two. This is probably due to the more healthy outdoor life and the greater social freedom of the modern girl.

Cause: The definite cause of the disease is unknown. It occurs in young girls of 13 to 17, at the time when they begin to menstruate, especially among those who live in poor hygienic surroundings and who work hard at sedentary occupations.

Symptoms

The symptoms are a severe anemia characterized by a reduction in the number of red blood corpuscles and a proportionate reduction in the percentage of hemoglobin. The red corpuscles and hemoglobin are often very low. The skin has a peculiar greenish tinge, and the patient has digestive disturbances with abnormal cravings for sour foods or chalk. The girls tire very easily, complain of palpitation of the heart and marked weak-

ness. They are very nervous and irritable and often get crying spells.

Treatment

The patient is usually advised to get plenty of fresh air and outdoor exercise. The usual diet for anemia is ordered, consisting principally of meats, vegetables, liver, bone marrow and similar foods. Iron and arsenic preparations are the remedies given. Blaud's pill is the most commonly used iron preparation. Hypodermic or intramuscular injections of iron and arsenic compounds is the modern method of administration.

PERNICIOUS ANEMIA

Pernicious anemia or idiopathic primary anemia is a disease of the blood characterized by a severe progressive anemia which is usually fatal.

Cause: The definite cause of the disease is unknown. Some physicians believe it is due to absorption of bacterial poisons from the large intestine, especially poisons produced by the Welch bacillus (Aerogenes Capsulatus bacillus). It is also thought to be due to a disturbance in the blood-forming organs, the liver and bone marrow, or to blood-destroying organs, the spleen, or to an improper diet.

The disease is more prevalent among Nordic types of patients, especially Swedes and Norwegians, and among patients with a certain characteristic constitution.

Symptoms

The symptoms may be divided into blood changes and clinical symptoms.

Blood Changes: The blood changes are a very severe anemia which has special characteristics. The red blood corpuscles are greatly reduced in number; the count may be as low as two million or one million to the cubic millimeter or even less. The percentage of hemoglobin is also reduced, but not in proportion to the red corpuscles. Consequently the individual cells are darker in color.

The blood index is the ratio of the hemoglobin percentage to the number of red cells. When the red cells are reduced more than the hemoglobin, as in pernicious anemia, the index is high or more than one.

The blood also contains unusual forms of red blood corpuscles: megalocytes, or large corpuscles, microcytes, small ones, nucleated red blood corpuscles, and poikilocytes or irregular shaped cells.

Clinical Symptoms: The principal symptom is marked pallor of the skin and mucous membranes. The patient complains of fatigue, weakness, shortness of breath, palpitation of the heart, swelling of the ankles and loss in weight. A characteristic and early symptom is diminution in the hydrochloric acid in the gastric juice, a condition known as achylia gastrica. Consequently the patient suffers from digestive disturbances, distention with gas or pains in the stomach. Frequently stomatitis, a characteristic inflammation of the gums and mouth, develops. In spite of the severe anemia, however, the patient feels fairly comfortable. As the disease progresses the skin becomes almost lemon yellow in color and the weakness is so marked that the patient cannot get out of bed.

The disease runs an intermittent course for three or four years, characterized by periods of severe anemia alternating with periods of improvement.

Complications: Pernicious anemia frequently affects the nervous system, especially the spinal cord. As a result pains and anesthesia in the arms and sometimes paralysis of groups of muscles develop.

Treatment

Pernicious anemia is a fatal disease, but periods of improvement occur throughout its course, even without treatment.

The disease is treated by frequent transfusions, by a special diet, by various remedies and by methods which attempt to remove the supposed cause.

Transfusion: Transfusions are given whenever the red corpuscles are markedly diminished. Some patients are kept in fairly good health for years by means of frequent transfusions.

Diet: It has recently been found that pernicious anemia can often be markedly improved by foods rich in blood-forming substances and iron. The diet therefore consists principally of liver, especially chicken liver, bone marrow, beef, green vegetables and eggs.

Remedies: The remedies commonly used are iron and arsenic preparations such as iron arsenate, iron cacodylate, sodium cacodylate, atoxyl, and other similar substances. Dilute hydrochloric acid is frequently given to supply the absent hydrochloric acid in the stomach.

Causative Methods: Some physicians give colon irrigations

with acriflavine or acriviolet solutions or they flush out the entire intestinal tract with such solutions by means of a duodenal tube, because they believe the absorption of bacteria from the large intestine to be a cause. A special antitoxin made from the Welch bacillus is being tried by hypodermic injection. In severe cases the spleen is often removed to check excessive destruction of red blood cells.

POLYCYTHEMIA

Polycythemia is a disease of the blood of unknown origin characterized by an increase in the number of red blood corpuscles and in the percentage of hemoglobin.

The symptoms are persistent cyanosis or blue color of the skin, which is sometimes associated with an enlarged spleen. There is no specific treatment.

ABNORMAL CHANGES IN LEUCOCYTES

The percentage of the white blood corpuscles in the blood is frequently changed. This may occur as a symptom in certain diseases or it may be the important characteristic of a disease of the blood. The conditions characterized by leucocyte changes may therefore be divided into two groups as follows:

1. Symptomatic Changes.
2. Blood Diseases affecting White Blood Corpuscles.

Symptomatic Changes

The increase or diminution in the percentage of the leucocytes of the blood is often a characteristic symptom in many diseases. It occurs in three forms: leucocytosis, leucopenia and changes in specific leucocytes.

Leucocytosis: Leucocytosis is an increase in the number of white blood corpuscles and occurs especially in infections such as acute appendicitis, an abscess anywhere in the body, or pneumonia, etc.

Leucopenia: Leucopenia is a reduction in the number of leucocytes. It is a characteristic symptom in certain infections, especially typhoid fever and tuberculosis.

Changes in Specific Cells: In some diseases only certain forms of white blood corpuscles are increased. The polynuclear leucocytes are increased in diseases or conditions characterized by pus formation. When parasites such as tapeworms occur in

the intestines the number of eosinophiles are increased. In typhoid fever and tuberculosis the number of lymphocytes are increased.

DISEASES AFFECTING THE WHITE BLOOD CORPUSCLES

The important feature of the following diseases is an increase and change in the character of the white blood corpuscles.

LEUKEMIA

Leukemia is a disease characterized by an increase in the white blood corpuscles of the blood. The definite cause is unknown, but it is probably a disease of the bone marrow and other blood-forming organs, which are stimulated to form more leucocytes.

Clinical Forms

The disease occurs in several forms which are usually classified according to the kind of leucocytes which are increased in the course of the disease, as follows:

1. Acute Lymphatic Leukemia.
2. Chronic Myelogenous Leukemia.

Acute Lymphatic Leukemia is a rapidly fatal disease characterized by an increase in the number of lymphocytes.

Chronic Myelogenous Leukemia is a chronic disease of the blood and blood-forming organs characterized by an increase in the number of white blood corpuscles and by the presence in the blood of unusual forms of leucocytes called myelocytes.

Symptoms

The symptoms of leukemia may be divided into blood changes and clinical symptoms.

Blood Changes: The characteristic feature of leukemia is an increase in the number of leucocytes, which may be as much as 50,000 or 200,000 or 300,000 to the cubic millimeter. In lymphatic leukemia, the leucocytes consist principally of small lymphocytes. In myelogenous leukemia they consist principally of abnormal forms of leucocytes, containing peculiar granules, which are known as myelocytes. These cells occur normally in the bone marrow. The red blood cells are usually also diminished in all forms of leukemia.

Clinical Symptoms: The chief symptoms are weakness, shortness of breath, pains in various parts of the body, a marked tendency to hemorrhage, and enlargement of the lymph nodes and spleen.

A tendency to hemorrhage is a characteristic symptom of the disease. There may be bleeding from the nose, mouth or intestines. Small hemorrhages or petechiæ may occur in the skin; sometimes the spots are quite large and resemble black and blue spots resulting from injury.

The lymph nodes throughout the body gradually become enlarged, especially those in the groin, the neck and the armpits. The spleen is usually enlarged, especially in the myelogenous form.

Aleukemic Stage: This is a rare form of the disease in which all the symptoms are present, except the increase in the number of leucocytes. As the disease progresses the number of leucocytes gradually increase.

The disease is fatal and the patient dies of progressive weakness and hemorrhage.

Treatment

Leukemia is usually treated by applying X-rays or radium over the spleen or bone marrow. Arsenic, iron and benzol are the remedies commonly ordered. Sometimes transfusions are given repeatedly and occasionally the spleen is removed.

HODGKIN'S DISEASE

Hodgkin's disease is a chronic fatal disease characterized by an enlargement of all the lymph nodes throughout the body.

Cause: The cause is unknown, but the disease is believed to be caused by an infection.

Symptoms

The lymph nodes in the neck, the chest or the abdomen gradually become enlarged. At first they are about the size of hazel nuts, but they gradually increase in size and become adherent to one another, forming large irregular shaped masses.

The symptoms vary according to the location of the enlarged lymph nodes. They are due to pressure on neighboring structures. When the lymph nodes in the chest are enlarged, pain in the chest, shortness of breath and cyanosis develop. The

enlargement of the abdominal lymph nodes causes attacks of pains and intestinal symptoms.

The microscopic appearance of the lymph nodes is characteristic. The disease is therefore usually diagnosed by removing one of the lymph nodes and examining it microscopically.

Treatment: X-rays, radium and transfusions are the usual methods of treatment.

AGRANULOCYTIC ANGINA

Agranulocytic angina is a rare fatal disease characterized by a severe inflammation of the throat associated with diminution in the number of leucocytes, especially the polynuclear leucocytes, and jaundice.

DISEASES OF THE BLOOD PLATELETS

The characteristic feature of the following diseases is a disturbance in the blood platelets.

PURPURA HEMORRHAGICA

Purpura Hemorrhagica is a disease of unknown origin characterized by a tendency to hemorrhage.

Cause: The definite cause is unknown, but it occurs especially in young persons.

Symptoms

The symptoms may be divided into blood changes and clinical symptoms.

The blood changes are an increase or a diminution in the number of blood platelets and diminution in the clotting power of the blood.

The clinical symptoms are hemorrhages into the skin and mucous membranes. The hemorrhages in the skin may be tiny spots or petechiæ or large ecchymoses producing black and blue spots. Sometimes hemorrhages from the stomach, intestines, nose or gums occur. As a result of frequent and continued bleeding the patient becomes anemic. The lymph nodes and spleen are usually enlarged.

The disease is fatal and death usually results from a severe hemorrhage.

Symptomatic Purpura: The tendency to hemorrhages, especially into the skin and mucous membrane, often occurs as a

symptom in rheumatic fever, in leukemia, in bacteriemia and other infections.

Treatment

The disease is treated by transfusions, X-ray, iron and arsenic preparations. Sometimes the spleen is removed.

DISTURBANCES IN BLOOD CLOTTING

The following disease is characterized by inability of the blood to clot.

HEMOPHILIA

Hemophilia is an hereditary disease characterized by excessive bleeding because the clotting power of the blood is diminished.

Cause: The cause of the disease is unknown, except that it is hereditary. The disease affects only male members of bleeder families, but the female children of male hemophiliacs transmit the disease to their own male children.

Symptoms

The chief symptoms of the disease are prolonged bleeding, and a diminution in the clotting power of the blood.

The patient may bleed for hours or days after a tooth is extracted, or from a cut or any other injury, or after an operation. Sometimes a sudden spontaneous hemorrhage occurs into the larynx or a joint. The patient may die from a severe hemorrhage which continues in spite of all efforts to control it.

Treatment

Bleeders should choose occupations in which the possibility of injury is minimized. They should be careful to avoid cuts or injuries. They should not undergo serious operations unless it is absolutely necessary. When bleeding occurs, transfusions are done and calcium salts, horse serum, thromboplastin, and other similar substances are given to improve the clotting power of the blood.

To prevent transmitting the disease the female children of hemophiliacs should not marry.

DISEASES OF THE SPLEEN

Physiology of the Spleen: The spleen is a large bean-shaped

organ situated in the left upper quadrant of the abdomen. It is believed to be a ductless gland which has the following functions:

1. It forms red blood corpuscles before birth and throughout life in certain diseases.
2. It forms lymphocytes and mononuclear forms of white blood corpuscles.
3. It destroys red blood corpuscles.
4. It forms antibodies against infections; it destroys bacteria and neutralizes their poisons.

Symptoms of Diseases of the Spleen: Diseases of the spleen are usually characterized by enlargement of the spleen and sometimes by changes in the red and white blood corpuscles.

Common Diseases of the Spleen

Diseases of the spleen are rare, but the following are the most common forms in which they occur:

Symptomatic Enlargement: The spleen is usually enlarged in various infectious diseases, especially typhoid fever, malaria and other infections. It is markedly enlarged in leukemia, pernicious anemia, purpura hemorrhagica and other blood diseases and in cirrhosis of the liver.

Movable Spleen: This is a floating or low hanging spleen associated with visceroptosis, and it sometimes causes pain in the left upper quadrant of the abdomen. **Torsion or twisting of the spleen** is a rare complication, which produces severe abdominal pain and shock. A movable spleen is sometimes treated by abdominal belts. Torsion or twisting of the spleen usually requires an immediate surgical operation.

Rupture of the Spleen: This sometimes occurs when a diseased spleen increases rapidly in size or from an abdominal injury. The symptoms are severe abdominal pain, shock and the symptoms of internal hemorrhage. The condition usually requires an immediate operation.

Embolism and Infarct of the Spleen: This is a common complication in bacteriemia or bacterial endocarditis. It causes sudden pain in the left upper quadrant of the abdomen with enlargement of the spleen. It is associated with the usual symptoms of bacteriemia.

Splenic Anemia, Banti's Disease, or Splenomegaly: This is a rare progressive chronic disease of the spleen which occurs especially in children. It is characterized by enlargement of the

spleen, pallor, weakness, digestive disturbances, severe anemia, and is usually followed by cirrhosis of the liver and ascites.

It is treated by transfusions, by iron and arsenic preparations and by removing the spleen.

Gaucher's Disease: This is a rare disease which occurs especially in infants and young children, characterized by a large spleen and severe anemia, diminished leucocytes and a tendency to hemorrhages. It is treated by transfusion and by removing the spleen.

Hemolytic Jaundice: This is a rare disease which is usually hereditary, but it may result from malaria, dysentery, gall-bladder infection or syphilis, which cause excessive destruction of red blood corpuscles. It is characterized by enlargement of the spleen, jaundice and a severe anemia. During the course of the disease the patient has attacks of severe abdominal pain, fever and increased jaundice and anemia. The disease is cured by removing the spleen.

CHAPTER XXII

DISEASES OF THE MOUTH, SALIVARY GLANDS AND ESOPHAGUS

DISEASES OF THE MOUTH

The most common diseases of the mouth are inflammations, ulcers, specific diseases and cancer.

STOMATITIS

Stomatitis is an inflamed or irritated condition of the mouth.

Symptoms

The symptoms are bad breath, pain, especially on chewing, an increased flow of saliva and a characteristic appearance of the mouth which varies with the type of stomatitis.

Clinical Forms

Stomatitis occurs in several forms, as follows:

1. Simple Stomatitis.
2. Thrush.
3. Ulcerative Stomatitis.
4. Mercurial Stomatitis.
5. Syphilitic Stomatitis.
6. Trench Mouth.
7. Gangrenous Stomatitis.

Simple Stomatitis is an acute irritated or inflamed condition of the mouth. It usually results from irritating foods, mild infections and in children from the eruption of teeth and sometimes from a vitamine deficiency. It is treated by avoiding irritants and by antiseptic mouth washes.

Thrush is a form of stomatitis which occurs in nursing infants, caused by a form of fungus called Oidium albicans. It is characterized by small white patches resembling flakes of curdled milk which occur in the mucous membrane of the mouth. Sometimes intestinal and stomach symptoms develop. It is treated

by keeping the mouth clean and rubbing with boric acid or sodium bicarbonate solutions.

Ulcerative Stomatitis is a form of stomatitis characterized by small superficial ulcers in the mouth or on the gums. It is caused by the irritation of plates of false teeth, especially in old people, or in run-down conditions. It is treated by removing false teeth until the ulcers heal and by antiseptic mouth washes. The ulcers are treated by local applications of silver nitrate.

Mercurial Stomatitis is a form of stomatitis caused by mercury poisoning or continued administration of mercury preparations. It is characterized by soft spongy bleeding gums with loosening of teeth. It is treated by potassium chlorate mouth washes and by applying silver nitrate solutions or tincture of myrrh to the gums.

Syphilitic Stomatitis is a form of stomatitis which occurs in the second stage of syphilis. It is characterized by mucous patches, which are oval whitish or bluish white spots which develop on the mucous membrane of the mouth and throat. Syphilitic ulcers also occur in the mouth in the third stage of syphilis. The condition is treated by the usual antisyphilitic remedies.

Trench Mouth is a severe form of inflammation of the mouth and throat which frequently occurred among soldiers in the trenches during the World War. It is characterized by a grayish membrane in the mouth, on the tonsils and pharynx. The disease is a form of Vincent's angina, a severe infection of the floor of the mouth caused by the Spirillum of Vincent. It is treated by hydrogen peroxide mouth washes, by local applications of iodine or salvarsan and by intravenous injections of salvarsan.

Gangrenous Stomatitis or Noma is a very severe fatal inflammation of the mouth and jaw which sometimes occurs in children as a complication of measles or other severe infections. It is characterized by gangrene and destruction of the tissues in the mouth, jaw and palate. It is treated by antiseptic mouth washes and sometimes by surgical measures.

DRY MOUTH

Dryness of the mouth or Xerostomia is a condition in which the mouth and tongue are dry and sometimes fissured. It usually occurs in diabetes, old age or wasting diseases. The patient sometimes has difficulty in chewing.

The condition is treated by various mouth washes contain-

ing glycerin or boroglyceride and by proper hygiene of the mouth.

CANCER OF THE MOUTH

Cancer of the mouth is a form of cancer which develops in various structures in the mouth. It usually forms a slow-growing tumor mass which involves the neighboring structures and the lymph nodes in the neck. The tongue, lips and throat are the most common sites where cancer develops. The treatment is surgical.

DISEASES OF THE TONGUE

GLOSSITIS

Glossitis is an inflammation or irritation of the tongue which occurs in an acute and chronic form.

Acute Glossitis is caused by irritants, hot foods or by various poisons. The tongue becomes red, painful and swollen and there is difficulty in chewing and swallowing. It is treated by keeping pieces of ice in the mouth and by antiseptic mouth washes.

Chronic Glossitis is caused by continual irritation of the tongue, by smoking, alcohol or by jagged teeth. It is common in constitutional diseases such as diabetes, syphilis and anemia. The tongue is red, painful, sometimes unusually smooth or fissured, and there may be small ulcers on its surface. It is treated by removing the cause, by antiseptic mouth washes and by cauterizing the ulcers with silver nitrate or other astringents.

Leukoplakia is a form of stomatitis characterized by a callous-like thickening of the mucous membrane of the tongue and mouth. It is common among smokers, and is also caused by alcohol, syphilis and other irritants.

COATED TONGUE

The tongue is often coated with a thick grayish fur. This usually occurs in fevers and in various forms of stomach or intestinal disease. In diabetes the tongue has a peculiar raw beef appearance. In scarlet fever and other infections the appearance of the tongue is characteristic.

A coated tongue and accumulation of mucus in the mouth

makes the patient quite uncomfortable. The coating may be removed by rubbing the tongue with a piece of gauze soaked in bicarbonate of soda solution or glycerin and lemon juice. Rubbing the tongue with half a lemon and granulated sugar is another effective method of removing the coating.

DISEASES OF THE SALIVARY GLANDS

The most common diseases of the salivary glands are ptyalism and inflammation of the parotid gland.

PTYALISM

Ptyalism is a condition characterized by excessive flow of saliva. It occurs as a symptom of mercury poisoning or after giving pilocarpine. It sometimes occurs during pregnancy, at menstruation and in exophthalmic goiter and rabies. It may also occur in nervous conditions such as diseases of the fifth nerve, hysteria or epilepsy.

The condition is treated by atropine and sedatives.

PAROTITIS

Parotitis is an inflammation of the parotid gland. The disease often occurs as a complication in typhoid fever, pneumonia, bacillary dysentery, syphilis and diseases of the genital organs.

Epidemic parotitis or mumps is a contagious disease already described.

The symptoms of parotitis are principally swelling of the parotid gland, usually on one side, associated with fever and the symptoms of the disease in which it occurs as a complication. Sometimes the other salivary glands are also swollen.

The disease is treated by rest in bed and local applications of ichthyol salves or other remedies to the parotid gland.

Chronic Parotitis is a chronic inflammation of the parotid gland which sometimes follows mumps.

OTHER DISEASES OF THE PAROTID GLAND

Salivary Calculus is a stone which sometimes forms in the duct of the parotid gland. It causes a painful swelling in the gland.

Mixed Tumor is the most common form of tumor which occurs

in the parotid gland. It forms a large mass in the gland which usually grows very slowly.

DENTAL INFECTIONS

Dental infections are frequent causative factors in many diseases. The most common infections of the teeth are abscesses within the teeth, or at their roots, and pyorrhea. When a tooth becomes carious an abscess frequently develops in the root or around the tooth.

Pyorrhea alveolaris is a chronic condition characterized by infection of the teeth characterized by a constant secretion of pus around the roots of the teeth. It is caused by bacterial and amebic infection, by improper diet; chronic illnesses, old age and anemia are predisposing causes.

Symptoms: The symptoms of dental infections are local and general. The local symptoms belong to the domain of dentistry. The general symptoms result from inability to chew food and from the effect of dental infections on other organs.

Difficulty in chewing often causes various forms of indigestion and functional disorders of the stomach.

Some physicians believe that certain forms of stomach disease, gall bladder disease or appendicitis are caused by constantly swallowing pus from infected teeth.

Chronic arthritis, heart disease, nephritis and anemia are sometimes caused by constant absorption of pus or poisons from abscesses in the teeth or from pyorrhea.

Dental infections are often recognized by X-ray examination of the teeth. They are treated by proper dentistry.

DISEASES OF THE ESOPHAGUS

Esophagal Symptoms

The esophagus is a long muscular tube situated in the neck and thorax, whose function is to propel food into the stomach. Disease in the esophagus usually produces pain on swallowing and sometimes obstruction in the esophagus. When food accumulates above the obstruction vomiting often results.

The physician employs special methods of examination in diseases of the esophagus, such as esophagoscopy and X-ray examination, especially when the symptoms are not typical.

The esophagoscope is a long tubular instrument containing a

small electric light at its end, which is inserted into the esophagus. The physician is able to observe diseased conditions in the esophagus through this instrument.

X-ray examination of the esophagus, after administering bismuth or barium mixtures, will demonstrate the outline of the esophagus or an obstruction of its lumen.

The most common diseases of the esophagus are stricture and cancer. Esophagitis, cardiospasm and diverticulum are rare diseases of the esophagus.

ESOPHAGITIS

Esophagitis is an inflamed or irritated condition of the esophagus. It occurs in an acute and chronic form.

Acute esophagitis is usually caused by swallowing hot or irritating foods or corrosive poisons. It may also develop in severe infections.

Symptoms: The chief symptoms are pain on swallowing and regurgitation of food. In severe cases mucus, blood and pus is regurgitated.

Treatment: The condition is treated by a bland, nonirritating diet consisting of milk, cereals and eggs, and by demulcent remedies, such as acacia, mineral oil and similar substances.

Chronic esophagitis is a chronic irritation of the esophagus, usually caused by excessive use of alcohol or tobacco or irritating foods. It causes pain on swallowing and sometimes regurgitation of food.

STRICTURE OF THE ESOPHAGUS

Stricture of the esophagus is an obstruction in the lumen of the esophagus.

Cause: The condition usually results from swallowing an irritant, either accidentally or intentionally, such as strong acids, alkalies or other chemical substances. It occurs in children after swallowing lye accidentally.

Pathology: When a corrosive poison is swallowed it causes severe irritation and inflammation of the esophagus with destruction of its lining membrane. When healing takes place a scar forms which gradually contracts and produces an obstruction or makes the lumen of the esophagus narrower.

Symptoms

The symptoms are usually progressive difficulty and pain on swallowing. At first the patient is unable to swallow solid or semi-solid food. As the obstruction increases even liquid food cannot be swallowed. As a result of persistent obstruction the part of the esophagus above the stricture becomes dilated by the accumulation of undigested food. This produces attacks of vomiting of large quantities of undigested foul-smelling food. The patient gradually loses weight and strength because he is unable to swallow food.

X-ray examination will demonstrate the stricture in the esophagus.

Treatment

The disease is treated by a suitable diet, by bougies, or by surgical methods.

The diet consists only of foods which the patient can swallow, usually liquids or cereals, thick soups, custards or foods of a similar consistency.

The physician often attempts to dilate the stricture by passing bougies of increasing thickness into the esophagus. Bougies are long firm but pliable rods made of rubber or woven material, which come in various sizes.

Strictures which completely obstruct the esophagus are treated by a gastrostomy operation. This consists of sewing the stomach to the abdominal wall and making a permanent opening into the stomach through which the patient is fed.

CARCINOMA OF THE ESOPHAGUS

Cancer of the esophagus is the most common disease of the esophagus. The cause is unknown and is probably dependent on the same factors that cause other forms of cancer.

Pathology: The disease process is a cancerous growth in the esophagus, which usually occurs in its upper part. The cancer may be a small ringlike growth or it may extend along the esophagus for a considerable distance.

Symptoms

The symptoms of carcinoma of the esophagus are principally pain on swallowing and the symptoms of progressive obstruction to the passage of food through the esophagus. At first the patient is unable to swallow solid food, then semi-solid food, and finally

even fluids cannot be swallowed. Sometimes food accumulates above the obstruction and the patient may vomit large quantities of undigested putrefied food, which frequently contains blood.

As a result of the difficulty in swallowing, the patient becomes pale, anemic, loses weight and strength and also develops the characteristic cachexia of cancer. The X-ray examination of the esophagus will demonstrate the obstruction and frequently the cancerous growth.

Treatment

Carcinoma of the esophagus is treated by a gastrostomy operation and sometimes by a radical operation to remove the cancer. The gastrostomy operation consists of making a permanent opening into the stomach through the abdominal wall for feeding purposes. In early cases, this operation is followed by a radical operation for removal of the cancer. When the disease is extensive only a gastrostomy operation is performed and nutrition is maintained by feeding through the permanent opening.

CARDIOSPASM

Cardiospasm is a rare condition characterized by spasmodic contraction of the esophageal opening into the stomach.

Cause: The condition occurs especially in nervous or hysterical young women. It occasionally develops as a reflex symptom in ulcer of the stomach or gall-bladder disease.

Symptoms

The principal symptoms are a feeling of obstruction on swallowing food and sometimes pain in the pit of the stomach or under the sternum. As the disease progresses food is regurgitated immediately after eating.

The physician is unable to pass a stomach tube into the stomach because its opening is obstructed. X-ray examination will show an obstruction at the cardiac end of the stomach.

Treatment

Cardiospasm is treated by a suitable diet, by sedatives, and by dilating the esophagal opening.

The diet consists of bland liquid or soft food which can pass the obstruction. Various sedatives are given to relieve the underlying nervous or hysterical condition, and atropine to relax

the spasm. The physician attempts to dilate the opening by passing bougies of increasing thickness or by a special instrument, an esophageal dilator.

DIVERTICULUM OF THE ESOPHAGUS

Diverticulum of the esophagus is a pouch which sometimes develops in the wall of the esophagus, usually in the region of the neck. The pouch may be very small or quite large. It usually results from a local area of weakness in the muscle wall of the esophagus.

Symptoms: The symptoms are sudden attacks of vomiting of putrefied undigested food. The diverticulum gradually fills up with food and when the pouch is filled its contents are expelled by the act of vomiting. The condition is usually diagnosed by an X-ray picture taken after giving a barium mixture, which demonstrates the pouch.

The diverticulum is usually removed by a surgical operation.

CHAPTER XXIII

DISEASES OF THE STOMACH

In order to understand the symptoms and methods of treating diseases of the stomach it is essential to understand the process of digestion.

Physiology of Digestion

Foods: All foods consist of a combination of several of the following food principles:

Water
Salts
Carbohydrates
Fats
Proteins
Vitamines.

Water is present in nearly all foods. It is an essential food element and keeps the salts in solution. Salts are essential to life and are contained in all vegetables, milk, meat and various other foods. The most common salts found in foods are the salts of calcium, magnesium and potassium.

The carbohydrates are foods which provide energy for the body. They are divided into several groups; simple sugars, disaccharides or complex sugars and polysaccharides or starches. Sugar, starches and potatoes are the best examples of carbohydrate foods. Bread, cereals, beans, carrots and liver contain large quantities of carbohydrates.

Fats provide energy for the body and are stored up for reserve energy. The foods which consist entirely of fat are olive oil, butter, and fat of meat. Cream contains large quantities of fat.

Proteins are elementary food substances which are utilized to build and repair tissues. Meats, fish, eggs and cheese are examples of protein foods.

Vitamines are substances found in various food which are necessary for growth and nutrition.

Mechanism of Digestion: Digestion begins in the mouth. The

act of chewing breaks up the food into small pieces. The carbohydrates in the food are partly changed to sugars by the saliva, an alkaline digestive juice which contains a ferment, ptyalin. When the food is swallowed this process continues for a short time in the stomach until a sufficient amount of gastric juice is secreted, when it stops, due to the presence of acid.

In the stomach the protein food is partially digested to simpler substances, peptones, by means of the hydrochloric acid and pepsin; and the proteins of milk are coagulated. Some fats are also slightly broken up into fine globules or emulsified by a ferment called gastric lipase. The stomach is a large organ and holds quantities of food for about one to five hours and digestion continues during this time.

The secretion of gastric juice may be stimulated by certain kinds of food such as soups, broths, gravy or spicy foods, and by the taste and smell of food.

The main process of digestion is carried on in the duodenum or first portion of the small intestine, principally by the pancreatic juice. When partially digested food enters the duodenum, a ferment called secretin develops in its mucous membrane. This is carried by the blood to the pancreas and starts its secretion.

Pancreatic juice contains three ferments: trypsin, amylopsin and steapsin.

Trypsin is made active by enterokinase, a ferment secreted by the mucous membrane of the small intestine. It completes the digestion of the proteins in the food, changing them to simpler substances, amino acids, which are then absorbed into the blood.

Amylopsin or pancreatic amylase completes the digestion of starches and sugars, changing them to glucose, which is then absorbed into the blood stream.

Steapsin or pancreatic lipase breaks up the fats into its constituent substances, fatty acids and glycerin, after they have been emulsified by the bile. The fatty acid and glycerin then pass through the mucous membranes in the intestine and form fat again.

The process of digestion is continued in the small intestine by the secretion of its mucous membrane, succus entericus. This contains several ferments; erepsin and inverting ferments. Erepsin is a ferment which completes digestion of protein foods to amino acids.

The inverting ferments are ferments which change complex sugars to simple ones (disaccharides to monosaccharides). Maltase is a ferment which changes maltose and dextrin, a substance

resulting from digestion of starches, to glucose. Invertase is a ferment which changes sucrose (or cane sugar) to glucose or levulose. Lactase is a ferment which changes lactose or milk sugar to dextrose and galactose.

Peristalsis: Peristalsis is a series of wavelike contractions which occur in various hollow organs. The contractions of the esophagus propels the food into the stomach. The rhythmic contractions of the stomach gradually forces the food into the intestines. The peristalsis of the intestines keeps the digested food moving slowly along the intestinal tract.

Symptoms of Diseases of the Stomach

When the stomach is diseased the process of digestion is disturbed. The secretion of gastric juice, or the peristalsis, or both, may be increased or diminished. Some diseases also produce an obstruction along the digestive tract.

The symptoms may be divided into two groups: subjective and objective.

The subjective symptoms are frequently characteristic of a particular disease, for example, the pain in gastric ulcer is typical. On the other hand, the same symptoms may occur in many different diseases—for example, vomiting, nausea, flatulence or distention.

The objective symptoms frequently give definite evidence of the nature of the disease. In most diseases of the stomach, however, objective signs are obtained principally by an examination of the stomach contents or by examination with the X-ray.

Subjective Symptoms

The most common subjective symptoms of diseases of the gastrointestinal tract are the following:

Pain or colic
Nausea
Vomiting
Anorexia
Dysphagia
Belching
Pyrosis or heartburn
Flatulence
Fullness.

Pain: The pain in diseases of the stomach is usually cramplike in character and is therefore called colic. It is produced

by excessive peristalsis caused by undigested food or irritants. The pain caused by irritants usually starts in the stomach and extends all over the abdomen. The pain is usually localized in the region of the affected organ or near the diseased part of the organ. Thus, in ulcer of the stomach the pain is situated in the pit of the stomach; in ulcer of the duodenum in the right upper quadrant of the abdomen, etc.

The physician often diagnoses the nature of the disease in the stomach or intestines by the character of the pain. It is therefore important for the nurse to record accurately the following points about abdominal pain:

1. The character: whether it is sharp, dull or cramplike.
2. The location: whether it is localized in some area or occurs over the entire abdomen.
3. The radiation: whether it radiates and the direction in which it extends.
4. The relation to meals: whether it occurs before or after meals and how long before or after.
5. The manner of relief: what measures, foods, local or general remedies relieve it.

Vomiting: Vomiting is an act whereby the stomach suddenly expels its contents. Whenever a patient vomits the nurse should observe the following:

1. The relation to meals: whether the vomiting occurs before, after or between meals.
2. The character: whether it is merely an overflow or regurgitation, or projectile vomiting.

The nurse should always note and record the character of the vomited material or vomitus. This may consist of undigested food or it may contain bile, mucus or blood. The vomited material which contains blood is dark brown in color; the blood appears as small particles resembling ground coffee, hence it is called coffee ground vomitus. When a severe hemorrhage occurs in the stomach the vomited material contains clots of blood.

When vomiting continues the vomitus usually contains bile, which is greenish or yellow in color. The bile regurgitates into the stomach as a result of the continual spasmodic contractions of the stomach and intestines. The presence of bile in the vomited material may have no relation whatever to liver or gallbladder disease, but is merely an indication that vomiting has

been persistent or that it has occurred when the stomach was empty.

Vomiting may be caused by eating excessive quantities of food or drinking excessive quantities of liquid, by irritants or poisons or by disease of the stomach or gall bladder. It is also caused in a reflex manner, by disease of other organs in the abdomen, such as the appendix, the kidneys, uterus and ovaries, by pregnancy and disease of the brain.

When the stomach becomes overdistended with food or liquid the resulting contractions expel the contents.

In diseases of the stomach vomiting may result from irritation of the diseased area by gastric juice or food. Sometimes the passage of food is obstructed and food accumulates in the stomach and is finally expelled by vomiting.

In disease of the gall bladder the passage of a stone or infected material along the bile ducts often starts violent peristalsis of the neighboring structures which brings about vomiting.

In appendicitis vomiting often is produced by the violent peristalsis which is brought on by the diseased appendix.

In kidney stones, the passage of a stone from the kidney starts peristalsis and causes vomiting.

In pregnancy vomiting often occurs in the early months from the irritation of the enlarged and growing uterus.

In brain tumors and meningitis vomiting often results from irritation of the vomiting center in the brain.

Unusual Types of Vomiting: Projectile vomiting is a continued sudden expulsion of the stomach contents which may occur any time during the day or night. It usually occurs in meningitis or disease of the brain. **Fecal vomiting** is vomiting of liquid containing fecal material. It usually occurs in intestinal obstruction. The inability of intestinal contents to pass an obstruction in the intestines reverses the direction of peristalsis. As a result the intestinal contents flow back into the stomach and the vomited material contains feces.

Nausea: Nausea is a desire to vomit. It frequently precedes vomiting and it is usually due to an irritation in the stomach not sufficiently strong to produce vomiting.

Anorexia: Anorexia or a loss of appetite is a common symptom in diseases of the stomach. It may be caused by diseases of other abdominal organs. It is also a common symptom in fever.

Dysphagia: Dysphagia is difficulty in swallowing. It may be caused by an obstruction of the esophagus or a spasm in the

cardiac end of the stomach. It may also be caused by swelling in the throat and by enlarged or inflamed tonsils.

Belching: Belching is the expulsion of gas from the stomach into the esophagus and throat. It usually occurs when there is excessive formation of gas in the stomach as a result of fermentation or putrefaction.

Aerophagia: Aerophagia is a habit of swallowing air into the stomach and then bringing it up again. It sometimes occurs in nervous patients.

Pyrosis: Pyrosis or heartburn is a common symptom in diseases of the stomach. It is usually produced when the gastric juice contains excessive amounts of acid.

Water brash is the passage of gastric juice up through the esophagus into the throat. It produces an irritating sensation in the throat.

Fullness or Distress: Fullness or distress is a sense of discomfort and distention which sometimes occurs in the stomach after eating. It is a common symptom in diseases of the stomach. It may result when the stomach becomes filled with excessive quantities of food and drink, or when the contractile power of the stomach is diminished. It is sometimes caused by disease of neighboring organs, such as the gall bladder, or by weakness of the stomach muscles or general weakness.

Indigestion or Dyspepsia: Indigestion or dyspepsia is a frequent term used by patients to indicate many of the symptoms occurring in diseases of the stomach. When patients complain of indigestion or dyspepsia they usually mean fullness, distention, actual pain or discomfort, belching or nausea.

Objective Symptoms

The only objective symptoms which the nurse may observe is vomiting and the character of the vomited material.

The physician may determine localized areas of tenderness, abnormal distention and sometimes an abnormal mass in some part of the abdomen. He is also able to determine disturbances in the process of digestion by analyzing the contents of the stomach, the gastric juice, or the intestinal digestive secretions. The presence or absence of structural changes in the stomach can also be determined by X-ray and other methods of examination.

X-ray Examination of the Stomach and Intestines

The stomach and intestines are very frequently examined by

means of the X-ray after giving the patient milk or fermented milk containing bismuth or barium preparations. These substances coat the lining of the esophagus, stomach and intestines which then show as definite shadows in the X-ray pictures.

Method of Preparation: The patient is given a cathartic the evening before the X-rays are to be taken. At 7:00 A.M. a light breakfast of coffee and a roll is given. A low colon irrigation or an enema is often given about two hours later. About two hours later the patient is given about ten ounces of cooked cream of wheat and milk or fermented milk containing a mixture of bismuth or barium preparations. The X-rays are taken immediately after, and other pictures six and twenty-four hours later. No food is given until the six-hour picture is taken, but after that the patient is allowed a regular diet.

Test Meals

The nature of various diseases of the stomach is often determined by analyzing the contents of the stomach and the gastric juice. The stomach contents are obtained by passing a tube into the stomach, either when it is empty or after giving the patient a test meal. There are several kinds of test meals and methods of obtaining the stomach contents. The most common are the Ewald test meal and the Rehfuss or Fractional test meal.

Ewald Test Meal: This meal consists of a piece of toast without butter and a cup of tea without milk or sugar, and is given before breakfast while the stomach is empty. About three-quarters of an hour later a stomach tube is passed and the contents are withdrawn into a bottle. This should be properly labeled and sent to the laboratory. Some physicians order the stomach contents to be taken at a shorter or longer interval after the test meal according to the possible stomach disease which may be present. For example, a patient who has increased peristalsis will frequently empty the stomach more rapidly than normal. Consequently in such cases the stomach contents must be withdrawn sooner than usual, otherwise the stomach will be empty and no specimen will be obtained. On the other hand, if the peristalsis is diminished, or if the secretion of gastric juice is slow, it may be necessary to pass the tube longer than three-quarters of an hour after the administration of a test meal.

Rehfuss or Fractional Method: The Fractional test meal or the Rehfuss Method is a method of obtaining stomach contents every fifteen minutes for two hours. No breakfast is given the morning of the test. A duodenal tube is passed and swallowed

until the mark 2-3 is at the teeth. When the tube is in the stomach the gastric contents are aspirated. This is placed in a bottle and marked "fasting specimen."

The patient is then given two small slices of toast and eight ounces of water. The stomach contents are aspirated fifteen minutes later. The aspiration is then continued every fifteen minutes until eight specimens are obtained. Each specimen is kept in a separate bottle properly labeled and sent to the laboratory. The object of the Rehfuss test is to determine the degree of acidity of the gastric juice at different intervals after a test meal. In some persons the gastric juice contains the largest percentage of acid directly after a test meal while in others the maximum acidity develops one or two hours later.

Retention Test Meal: This is a test to determine the ability of the stomach to empty its contents. The patient is given a bowl of rice and raisins about 9 P.M. The following morning before breakfast a stomach tube is passed and the stomach contents are obtained. If there is an obstruction at the pylorus or if the stomach is dilated or its muscle wall weakened the raisins given the night before will be found in the stomach contents.

Examination of Stomach Contents: The contents of the stomach are usually examined to determine changes in the normal constituents of the gastric juice, the character of digestion and the presence of abnormal constituents.

The normal constituents of the gastric juice are hydrochloric acid and pepsin. The hydrochloric acid may be increased or diminished and the pepsin may be entirely absent.

The character of digestion is determined by the gross appearance of the stomach contents, that is, whether the food has been thoroughly broken up and whether carbohydrate food has been digested. The abnormal constituents usually looked for are mucus, blood, and various bacteria such as the Boas Oppler bacilli and sarcinæ, a species of yeast. It is beyond the scope of this book to discuss the methods of examination in detail.

Method of Obtaining Stomach and Intestinal Contents

The nurse frequently has to obtain stomach contents, gastric juice, bile or pancreatic juice for examination. The stomach contents and gastric juice are obtained by passing special tubes, a stomach tube or a duodenal tube into the stomach. The bile and pancreatic juice is obtained through a duodenal tube passed into the duodenum.

The Stomach Tube: The stomach tube is a long, narrow but

firm rubber tube used for obtaining stomach contents or irrigating the stomach. It comes in various sizes and it is always essential to use the proper sized tube for each patient. The tube should be sterilized before use and kept on ice to make it rigid. The nurse should explain the procedure to the patient before attempting to pass the tube because some nervous patients become apprehensive and excited.

Method of Passing Stomach Tube: The patient is placed in a sitting posture. The end of the tube is then slowly inserted into the mouth and the patient is instructed to swallow the tube, as if it were a piece of food. Without undue force, the tube is then gently passed into the esophagus and down into the stomach. When it enters the stomach the gastric contents are usually expelled or flow through the tube and may be collected in some suitable receptacle or bottle. Many physicians aspirate the stomach contents, by means of a rubber suction bulb, into a bottle which can be attached to the stomach tube.

Stomach Tube Difficulties: As a rule, passing a stomach tube is a simple procedure. The tube gently passes down the esophagus by the act of swallowing. In some nervous patients, however, the nurse will frequently encounter considerable difficulty. This is due largely to apprehension on the part of the patient. Occasionally, however, if the tube is not sufficiently firm, it may coil up in the mouth or become kinked in the stomach. When it is coiled in the mouth the tube should be withdraw and another attempt made. When it is kinked in the stomach the gastric contents may be obtained by gently moving the tube up and down.

Gastric Lavage: This is a method of irrigating the stomach to remove its contents. A tube is passed into the stomach in the usual way and a funnel with a long rubber tube is attached to the open end of the stomach tube. The funnel is elevated and filled with plain water or some medicinal solution. The liquid is then allowed to flow into the stomach while the funnel is gradually lowered below the level of the stomach. At this level the funnel becomes filled with stomach contents which are poured into a pail. This procedure is repeated until the stomach contents return absolutely clear.

The Duodenal Tube: A duodenal tube is a long, narrow rubber tube about 1/16th of an inch in diameter, at the end of which a small gold bucket with openings in its side is attached. The duodenal tube is passed into the stomach to obtain gastric juice or into the duodenum to obtain bile and pancreatic juice. It

is passed in the same way as a stomach tube. The patient is allowed to swallow the gold bucket and tube until it gradually enters the stomach. The tube is then forced by means of the peristalsis or contractions of the stomach into the duodenum. A mark on the tube indicates when the tube is in the stomach and when it is in the duodenum. When the tube is in the organ desired the contents are aspirated by means of a glass syringe.

The nurse frequently has to pass a duodenal tube and it is essential for her to know when a tube is in the stomach or when it is in the duodenum. The following are the methods used to locate the position of the tube:

1. An X-ray picture or fluroscopic examination of the stomach or duodenum will show definitely whether a tube is in place or not. This is too elaborate a method for general use.
2. The position of the tube may also be determined by aspirating with a syringe and testing the fluid with litmus paper. If the tube is in the stomach the aspirated fluid gives an acid reaction because the gastric contents contain hydrochloric acid. If the tube is in the duodenum the contents are alkaline because the duodenal contents are alkaline.
3. On aspiration the tube will collapse when it is in the duodenum and it will retain its normal contour when it is in the stomach because the stomach contains air and the duodenum does not.
4. The patient is given a drink of milk or some colored solution while the tube is in place, and immediately afterwards the liquid is aspirated. If the tube is in the stomach the milk or colored liquid will appear in the syringe at once, while if it is in the duodenum no fluid will be obtained.

Duodenal Tube Difficulties: The duodenal tube is sometimes unable to pass from the stomach into the duodenum. The following procedures are used to force the tube into the duodenum:

1. Large doses of atropine are given to relax the pylorus and permit the tube to pass into the duodenum.
2. A cathartic or an injection of pituitrin is given.
3. A string with a gold bucket is attached to the bucket of the duodenal tube. The patient swallows the string first and when it passes into the duodenum it carries the duodenal tube with it.

Other Uses of Duodenal Tube: The duodenal tube is also used for feeding and to flush out the intestinal tract with normal salt solution or water. Sometimes dilute solutions of various remedies such as acriflavine or other substances are given through the duodenal tube.

The tube is passed in the usual manner and the solution is allowed to flow into the tube slowly at frequent intervals.

Special Methods of Feeding in Stomach Diseases

An important part of the treatment of stomach diseases is the diet. The diet varies with the disease and with the preference of the physician. In some diseases special methods of feeding are used, especially duodenal feeding and rectal feeding.

Duodenal Feeding: Duodenal feeding is a method of feeding through the duodenal tube. The patient swallows the tube until it passes into the duodenum. It is then kept in the duodenum for a week or ten days and sometimes longer. The feedings are given by injecting liquid food with a syringe from a glass covered with a specially constructed top containing a three-way stop cock. A syringe is attached to one of the tubes on the cover and the stop cock turned to allow aspiration into the syringe. The stop cock is then turned in the direction of the duodenal tube and the food is slowly injected into the duodenum. The food must be liquid in order to flow easily through the narrow tube. It usually consists of mixtures of milk, eggs and lactose, often diluted, and is given in small quantities at frequent intervals. The special mixtures used will be described with the diseases where they are used.

Rectal Feeding: Rectal feeding is a method of giving food by rectum. It is used when the patient cannot take food by mouth, or when a duodenal tube cannot be passed. It is given as follows: The patient lies on the left side and a rectal tube is inserted into the rectum. By means of a funnel and rubber tube liquid food is slowly injected into the rectum. The patient now turns on the back and then on the right side for a short time to allow the food to enter the sigmoid. The mixtures usually given by rectum contain about eight ounces of peptonized milk, glucose and eggs, thoroughly diluted with water.

Enteroclysis or Murphy Method is frequently used for giving rectal feeding. It consists of inserting a small catheter into the rectum and allowing well diluted food to flow into the rectum very slowly, usually drop by drop. The food is more readily absorbed by this method of administration.

DISEASES OF THE STOMACH

Diseases of the stomach may be divided into two groups: organic diseases and functional diseases.

ORGANIC DISEASES OF THE STOMACH

ACUTE GASTRITIS

Acute gastritis is an acute inflammation or irritation of the mucous membrane of the stomach. The intestines are usually also irritated and the disease is therefore often called acute gastroenteritis.

Cause: The disease is caused by overeating, irritating foods, alcoholic liquors and bacterial or corrosive poisons.

When quantities of food are taken beyond the digestive power of the stomach, the undigested food acts as an irritant. Decayed or putrefied food contains poisons which irritate the stomach and intestines.

Ptomaine poisoning is a form of gastroenteritis due to putrefied food.

Botulism is a form of severe gastroenteritis caused by food contaminated with the Bacillus Botulinus, a germ which putrefies food. Alcoholic liquors, such as whisky, wines or beers, when taken in excess, frequently produce a severe irritation in the stomach.

Gastroenteritis is sometimes caused by various bacteria, the Dysentery Bacillus, the Influenza Bacillus, etc. These are specific infectious diseases already described. Corrosive poisons such as bichloride of mercury, strong acids, etc., cause the severest form of gastroenteritis.

Pathology: The disease process is a severe inflammation or irritation of the mucous membrane of the stomach. In severe cases there are hemorrhages in the stomach and when the gastritis follows corrosive poisons the mucous membrane may be destroyed.

Symptoms

The onset and severity of the symptoms depend on the cause. The symptoms following corrosive poisoning appear in a few minutes and are severe burning pain in the mouth and stomach and profuse vomiting, of undigested food, mucous and sometimes blood. This is often followed by the symptoms of collapse;

weakness, exhaustion, a rapid and thready pulse and slow shallowing breathing.

The symptoms following mild irritants such as overeating, decayed food, excessive drinking of alcoholic liquors, or infections usually appear the following day. The patient has loss of appetite, a sense of fullness or pain in the stomach, and nausea and vomiting. If the intestines are also affected diarrhea develops with frequent fluid stools and griping pains. There is usually a slight rise in temperature, headache, and a feeling of illness. If the disease is prolonged the patient gradually becomes weak and exhausted.

Treatment

In severe cases the stomach is usually washed out. When the disease is caused by corrosive poisons, egg white or albumin water is given to protect the mucous membranes, and a chemical antidote is given to neutralize the poison. When the poison is an acid, a weak alkali like sodium bicarbonate or lime water or milk of magnesia is ordered. When it is a strong alkali, a mild organic acid like lemon juice or vinegar is given. For metallic poisons sodium thiosulphate is often injected intravenously. The collapse is treated by various stimulants, adrenalin, cardiazol, strychnine, and similar remedies and by forcing fluids.

In the usual cases, which are commonly due to food poisoning, the gastrointestinal tract is thoroughly cleaned out by a good cathartic such as castor oil, Epsom salt, citrate of magnesia or similar substances. Colon irrigations are then given frequently to keep the intestines free of the poison or bacteria. Hot applications are applied to the abdomen to relieve the pain. Some physicians starve the patient for a few days and only give fluid and glucose by mouth and by rectum. The patient is usually put on a light diet consisting principally of broths or soups, thin cereals such as barley, rice, and skimmed milk. Gradually other foods are added, such as soft boiled eggs, toast, etc. Coarse vegetables and meat, however, are only added after most of the symptoms have subsided. The remedies usually ordered are various alkalies and sedatives to relieve the griping pains. For the diarrhea, bismuth preparations, tannigen, and sometimes opium preparations are given.

CHRONIC GASTRITIS

Chronic Gastritis is a chronic inflamed or irritated condition of the stomach.

Cause: The disease is caused by the constant use of irritants such as alcohol or tobacco. It is also caused by continually overeating or by eating irritating or indigestible food, or at irregular intervals.

It sometimes develops as a secondary condition in cirrhosis of the liver or in the course of chronic heart disease as the result of prolonged congestion of the stomach.

Pathology: The continued use of irritants causes destructive changes in the mucous membrane of the stomach. This gradually becomes atrophic and some of the functional cells of the membrane are replaced by connective tissue. As a result the secretory and motor functions of the stomach are disturbed. The secretion of pepsin and hydrochloric acid is diminished, there is an excessive secretion of mucus, and the peristalsis is usually increased.

Symptoms

The symptoms of chronic gastritis are usually those of indigestion or dyspepsia because the absence of hydrochloric acid in the stomach prevents normal digestion. As a result food ferments in the stomach and acts as an irritant. The term indigestion or dyspepsia is commonly used to indicate many stomach symptoms ranging from a sense of discomfort after meals or bloating with gas to actual nausea and vomiting. The most common symptoms are a sense of discomfort or fullness after meals, belching of gas, loss of appetite and bad odor from the mouth. Sometimes there is heartburn or cramplike pains in the pit of the stomach. Nausea and vomiting, especially in the morning, or diarrhea are other frequent symptoms. As the disease progresses the patient loses weight and strength and becomes anemic.

Examination of the stomach contents usually shows diminished hydrochloric acid and pepsin, and a large amount of mucus and fermented food.

Treatment

The disease is treated by preventive means, by a suitable diet, and by various remedies and therapeutic procedures.

Prevention: Chronic gastritis may be prevented by avoiding irritants such as alcoholic drinks, condiments, the excessive use of tobacco and large quantities of indigestible food. Infected or bad teeth should be treated to permit proper chewing.

Diet: The diet usually ordered consists of simple foods such as milk, fermented milk, broths, soup and eggs. Later chicken, baked or mashed potatoes, cooked vegetables in purée form and

jellies are added. Coarse vegetables, salads and fruits, meats, fats or fried food should be avoided.

Medicinal Treatment: The remedies usually ordered are dilute hydrochloric acid and pepsin given before meals to supply the deficient gastric juice; and various bitters such as nux vomica, gentian and strychnine to stimulate its secretion. The flatulence is treated by alkalies, peppermint, bismuth preparations, resorcin, salol and magnesium salicylate.

Some physicians order frequent gastric lavage with warm water and sodium bicarbonate.

GASTRIC AND DUODENAL ULCER

Gastric and duodenal ulcer is a disease characterized by the formation of an ulcer in the stomach or duodenum, the first portion of the small intestine. It is sometimes called peptic ulcer.

Cause: The specific cause of the disease is unknown. An infection of the mucous membrane of the stomach or duodenum by streptococci, interference with its blood supply or injury are factors which some physicians believe to be causative. It sometimes follows an extensive burn. The disease is more common in young or middle-aged persons who have a characteristic constitutional make-up. They are usually thin, nervous persons who frequently have palpitation of the heart, flushing of the face, pains in the stomach, and become tired and exhausted easily. It is believed that a disturbed function of the autonomic nerves supplying the stomach is an important predisposing cause of the disease.

Pathology: The structural changes in the stomach or intestines consist of the formation of an ulcer, which is usually situated at the pylorus or lesser curvature of the stomach or in the first portion of the duodenum. The ulcer may be superficial or deep and is often surrounded by adhesions. It may be round, large, or irregular in shape. As a rule, there is only one ulcer, but occasionally several ulcers develop. An ulcer occurs more frequently in the stomach than in the duodenum.

Symptoms

The symptoms usually develop gradually and may be divided into three groups: (1) subjective symptoms, (2) objective symptoms, and (3) changes in the character of the gastric contents.

Subjective Symptoms: The characteristic subjective symptoms are pain and discomfort after eating. The pain usually

occurs about one-half to two hours after meals, depending on the location of the ulcer. An ulcer near the cardiac end of the stomach will produce pain almost directly after eating; an ulcer at the pylorus produces pain about one hour after eating, while in ulcer of the duodenum the pain occurs two or three hours after eating. The pain is a burning sensation or is cramplike in character. In gastric ulcer it gradually wears off, while in duodenal ulcer it persists for hours. The pain is sometimes relieved by pressure such as bending over a chair or lying on some hard object.

The location of the pain also varies with the location of the ulcer. When the ulcer is situated in the cardiac end of the stomach, the pain is situated near the epigastrium; when it is further down near the pylorus or duodenum, the pain is situated in the upper quadrant of the abdomen, sometimes under the liver border.

In addition to the pain, there are sometimes nausea, vomiting and belching of gas, or a sense of distention. When vomiting occurs the vomited material is usually highly acid and contains undigested food and sometimes blood. The presence of blood in the vomited material is usually considered definite evidence of an ulcer. The blood is not bright red, but dark brown in color and looks like coffee, hence it is called "coffee ground" vomitus.

The patient also complains of various nervous symptoms: palpitation, anxiety, fatigue, sleeplessness, flushing of the face, etc., which are characteristics of the predisposing constitution.

Objective Signs: The objective symptoms of ulcer are usually a local point of tenderness, which varies with the location of the ulcer. When the ulcer is situated in the cardiac end of the stomach the tenderness is in the epigastrium. When it is situated in the pylorus or duodenum the tenderness is in the right upper quadrant of the abdomen.

As the disease progresses the patient is unable to eat on account of pain and gradually loses weight and strength and often becomes very anemic.

An ulcer is sometimes recognized by the string test. The patient swallows a small gold bucket attached to a string. The pressure of the string against the ulcer produces a small blood spot on the string.

X-ray Examination: X-ray examination of the stomach usually show changes in the shadows of the stomach or duodenum which indicate ulcer. The patient has to be specially prepared

for these pictures. The method has already been described (see page 293).

Changes in Stomach Contents: The stomach contents taken after a test meal show an increased amount of hydrochloric acid, sometimes blood in small quantities, or even in large quantities if the ulcer has been bleeding. The protein food is well digested, but starch is poorly digested.

In duodenal ulcer and sometimes in gastric ulcer blood may be found in the stools in very small quantities.

Complications

The most common complications of gastric or duodenal ulcer are hemorrhage, perforation and pyloric stenosis.

Hemorrhage: The bleeding may be a continual slight oozing from the surface of the ulcer or a severe hemorrhage from an opening in a blood vessel. The only symptom of slight continual bleeding may be the presence of blood in the stomach contents or in the stool. If the patient vomits there may be traces of blood in the vomited material. If the bleeding continues the patient becomes anemic. The skin and mucous membranes are pale and the blood count shows a reduction in the number of red blood cells and hemoglobin. When bleeding occurs from an ulcer in the duodenum blood appears in the stools as a thick substance resembling tar and the patient gradually becomes anemic.

A severe or sudden hemorrhage is characterized by a sudden attack of vomiting. The vomited material looks like coffee ground or contains dark brown clots. The blood is also passed in the stool as a dark tarry substance. If the bleeding continues, the symptoms of collapse develop; a rapid, weak pulse, slow shallow breathing, a pale, cold, moist skin, thirst and air hunger.

Perforation: A perforation is the most serious complication of ulcer of the stomach or duodenum. It may occur gradually or suddenly. When a perforation occurs slowly, adhesions develop around the area of the ulcer, which may give no symptoms other than increased pain or extreme tenderness in the region of the ulcer. When a perforation occurs suddenly, the patient develops a sudden severe sharp pain in the right upper part of the abdomen, usually in the spot where the patient had the ulcer pain. The pain is accompanied by vomiting and a rise in temperature and pulse rate. Gradually the symptoms of peritonitis develop: abdominal distention, rigidity of the muscles

in the upper part of the abdomen, rapid pulse and respiration and an increase in the number of leucocytes in the blood.

Pyloric Stenosis: Pyloric stenosis is a complication which sometimes results when an ulcer heals. The scar formed by the healed ulcer often makes the opening between the stomach and the intestines, the pylorus, narrower or obstructs it. If the ulcer is situated in the lesser curvature of the stomach the scar produced by healing sometimes forms an **hourglass stomach,** a stomach which resembles an hourglass.

The symptoms of pyloric stenosis or hourglass stomach are attacks of pain and vomiting. The vomited material contains large quantities of fermented or putrefied food, which has been eaten several days before. On account of the narrow opening some of the food is unable to pass into the intestines and remains in the stomach where it putrefies and ferments.

Treatment

Gastric and duodenal ulcer is treated medically or surgically.

Medical Treatment

The object of medical treatment is to lessen the predisposing nervous symptoms, to promote healing of the ulcer, to neutralize the excessive secretion of acid in the stomach and to relieve pain and other symptoms. It may therefore be divided into three parts as follows:

1. Treatment of the Nervous Symptoms.
2. Dietary Treatment.
3. Medicinal Treatment.

Treatment of Nervous Symptoms: The nervous symptoms which are an important predisposing cause of the disease are treated by complete rest in bed, by sedatives, and by eliminating all psychical irritation. The patient should be given all possible attention and his personality accentuated. In other words, a rest cure is an important part of the ulcer treatment.

Dietary Treatment: The diets usually ordered consist principally of protein food because they neutralize the excessive acid and foods which do not stimulate the secretion of hydrochloric acid such as white of eggs and various fats such as butter and cream.

The usual ulcer diet consists of milk, eggs and cream, olive oil and sweet butter, given in small quantities at frequent intervals; about every two hours. Gradually other simple foods are

added, such as chicken, well-cooked vegetables, etc. The patient should eat regularly and rest after each meal. All raw and coarse foods, acids, condiments, alcoholic liquors, tobacco and too hot or too cold foods should be avoided.

Medicinal Treatment: The remedies used in ulcer of the stomach or duodenum are alkalies, antispasmodics, nerve sedatives and special remedies. The alkalies commonly ordered are sodium bicarbonate, calcium preparations, milk of magnesia, or magnesia oxide, to neutralize the excessive acid. The doses and time of administration vary with the physician. When constipation is a symptom magnesia preparations are given because of its laxative effect. Bismuth subcarbonate, bismuth subnitrate and similar preparations are given to coat the ulcer and promote healing. For pain, especially when it is cramplike in character, stropine or belladonna is ordered. The nervous symptoms are treated by bromides or luminal.

A common prescription for ulcer of the stomach contains bismuth subnitrate to promote healing, sodium bicarbonate to neutralize the excessive acid, magnesia to lessen the tendency to constipation, atropine to lessen the spasmodic pain, and bromides to lessen nervousness. Occasionally other preparations such as silver nitrate or other astringents are given to stimulate healing.

Some physicians give hypodermic or intramuscular injections of sterile milk, or typhoid vaccine intravenously, to stimulate healing by nonspecific protein therapy or shock treatment.

Special Methods of Treatment

The following are special methods of treatment consisting of a diet combined with various remedies.

Sippy Treatment

This method consists of a diet of milk and cream given at frequent intervals together with large doses of alkalies to neutralize the excessive acid.

Diet: The feedings are given from 7 A.M. to 7 P.M. as follows:

First Three Days

Cream 1½ ounces Milk 1½ ounces	every hour
or	
Cream 2 ounces Milk 2 ounces	every 2 hours

On the subsequent days the following foods are added:

Fourth day: One soft-boiled egg.
Fifth day: One ounce of well-cooked cereal twice a day.
Sixth day: Milk and cream increased to two ounces at each feeding; two soft-boiled eggs a day.
Seventh day: Two ounces of well-cooked cereal twice a day.
Eighth day: Three soft-boiled eggs a day; two ounces of cereal three times a day.
Ninth day: Three ounces of well-cooked cereal three times a day.
Tenth day: Creamed soup once a day.
Eleventh day: Vegetable purée once a day.
Twelfth day: Bread and butter every day.
Thirteenth day: One baked potato a day.

Some physicians order custard or cooked fruits for dessert.

After the fifteenth day, vegetable purée, bread and butter and baked potato are given twice a day, and later three times a day. Some physicians order small quantities of meat after the fourth week.

Medication: About half an hour after each feeding the following powders are given alternately:

1. Magnesium oxide.....grs. x 0.6 gm.
   Sodium bicarbonate.....grs. x 0.6 gm.
2. Bismuth subcarbonate....grs. x 0.6 gm.
   Sodium bicarbonate.....grs. xxx 2.0 gm.

After the last feeding the powders are given alternately every half hour or every hour for three doses.

After ten or twelve weeks the quantities of food are doubled and two powders are given an hour after each feeding. After twenty weeks the patient gets three meals a day with a glass of milk and cream between, and the two powders after each feeding.

Einhorn Treatment

This method consists of injecting food into the duodenum through a duodenal tube and not allowing the patient to have any food by mouth. The object of the treatment is to keep the stomach completely at rest, and avoid irritation by food, thereby allowing the ulcer to heal.

The patient swallows a duodenal tube until it enters the duodenum and the tube is kept in place for a week or longer. The food is injected through the tube and consists of a mixture of milk, eggs and lactose.

Diet: Feedings are given every two hours from 6 A.M. to 8 P.M. or from 8 A.M. to 10 P.M., eight a day, as follows:

First day: Four ounces of milk, one egg, one tablespoonful of lactose at each feeding. Some physicians order one tablespoonful of barley flour or one tablespoonful of butter instead of lactose.

Second day: One ounce of milk is added at each feeding.

Third day: One ounce of milk is added at each feeding.

Fourth day: One ounce of milk is added at each feeding and 250 c.c of warm plain water is given through the duodenal tube twice a day, morning and evening, by the Murphy drip method.

Fifth day: Same diet as the day before, but water is increased to 500 c.c.

Sixth day: Same diet as the day before, but water is increased to 1000 c.c.

Medication: Alkalies, magnesia oxide and bismuth subnitrate are given by mouth three times a day before feeding. Sometimes sedatives or atropine are added.

Surgical Treatment

The surgical treatment of gastric ulcer consists of making a new opening between the stomach and intestine, by an operation called gastroenterostomy, to prevent food from passing over the ulcer area. It is also performed to relieve a pyloric stenosis or hourglass stomach which sometimes results when an ulcer heals. Subtotal gastrectomy is an operation sometimes done in severe or extensive ulcer. It consists of removing about two-thirds of the stomach to prevent recurrences.

Treatment of Complications

Hemorrhage: When a mild hemorrhage occurs the usual treatment is continued, but the quantities of food are reduced.

When the hemorrhage is severe the patient is kept in bed and under the influence of morphine. An ice bag is applied to the abdomen and no food is allowed, but cold water or ice pills are given frequently. If the bleeding persists a transfusion is done and nutrition is maintained by normal salt solution and glucose

given by rectum. The anemia resulting from hemorrhage is treated by iron preparations.

Perforation: The treatment of a perforation is surgical and the patient should be operated upon as soon as the diagnosis is made, the sooner the better, for his chances of recovery depend on an early operation.

The treatment of pyloric stenosis is also surgical and consists in making a new opening between the stomach and intestines, by a gastroenterostomy operation, to allow food to enter the intestines from the stomach.

PYLORIC STENOSIS

Pyloric stenosis is a narrow opening or obstruction between the stomach and duodenum. It usually occurs in adults, but a special form of the disease occurs in children and is known as **congenital hypertrophic stenosis.**

Cause: The cause of the condition in adults is usually an old healed ulcer in the stomach, a cancer at the pylorus, or adhesions around the pylorus from gall-bladder disease. Congenital hypertrophic stenosis is due to a spasm or contraction of a thickened muscle in the pylorus.

Symptoms

The symptoms of pyloric obstruction are continued or periodic vomiting, pain in the upper part of the abdomen, distention and belching. The stomach gradually becomes distended by the accumulation of food, which cannot pass through the narrow opening. As a result the vomiting increases in frequency and duration. The vomited material is therefore characteristic and consists of large quantities of undigested or putrefied food which has been eaten several days before. The continued vomiting often causes loss in weight and strength, and anemia.

Pylorospasm in children produces vomiting of large quantities of food several hours after feeding, continual vomiting after each feeding, or projectile vomiting.

The physician will often notice wavelike contractions extending across the abdomen in the region of the stomach. This is caused by the vigorous peristalsis of the stomach to overcome the obstruction. X-ray examination may show the enlarged spastic contracting stomach, which is usually dilated. The stomach contents usually contain undigested retained food and excessive quantities of gastric juice.

Treatment

Pyloric stenosis is treated by medical or surgical methods.

Medical treatment is only tried when the stenosis is not due to cancer. The patient is put on a diet consisting of small quantities of liquids or soft foods given at frequent intervals. The stomach is washed out repeatedly with large quantities of water and bicarbonate of soda. Atropine is usually given to relax the narrow pylorus.

Surgical treatment varies with the cause. If the stenosis is due to cancer in an early stage the stomach is removed. If it is due to a healed ulcer or adhesions around the pylorus, a new opening is made between the stomach and intestines by a gastro-enterostomy operation to allow food to enter the intestines from the stomach.

CANCER OF THE STOMACH

Cancer of the stomach is one of the most common forms of cancer.

Cause: The specific cause of cancer of the stomach or of any form of cancer is not defintely known. The disease, however, is much more prevalent above the ages of thirty-five or forty, and more commonly in males than in females. Some physicians believe that continual irritation, heredity and a meat diet are causative factors.

Pathology: A cancer usually develops at the pyloric end of the stomach, or at the lesser curvature. It originates from the cells of the mucous membrane and gradually invades the wall of the stomach and surrounding structures. The cancer occurs as a large glandular form, adenocarcinoma, or a hard scarlike form known as a schirrus type. It occurs particularly at the pylorus, often forming a tight ring or obstruction. As the cancer grows it gradually increases in size and some of the cells enter the lymphatics or blood stream and are carried to other organs; the lymph nodes, the liver, the abdomen or the lungs. Wherever the cancer cells lodge, they form new cancers similar to the original one, which are called metastases.

Symptoms

The symptoms of cancer of the stomach may be divided into three groups: (1) stomach symptoms, (2) general symptoms, (3) laboratory evidence.

Stomach Symptoms: The principal stomach symptoms are

pain, loss of appetite, especially for meats; fullness and discomfort after eating, belching and vomiting. The pain is not characteristic, but it is usually situated in the epigastrium or upper part of the abdomen. It may simulate the pain of any other form of stomach disease such as ulcer or chronic gastritis, or gall-bladder disease.

When vomiting occurs the vomited material may contain only mucus or undigested food, but it sometimes contains blood, which appears as dark brown material resembling coffee ground.

The physician is sometimes able to feel a cancerous mass in the upper part of the abdomen.

The symptoms of cancer of the stomach are often not characteristic. They are merely the symptoms of indigestion: loss of appetite, a sense of fullness, belching of gas, and occasionally vomiting. When, however, these symptoms develop suddenly after the age of thirty-five, and persist, cancer is always suspected.

General Symptoms: The general symptoms of cancer are usually characteristic: progressive loss in weight, weakness, pallor and a secondary anemia. As the disease progresses the patient develops typical cachexia, a peculiar yellowish pallor, weakness and rapid loss in weight. Sometimes the general symptoms develop before the stomach symptoms.

Laboratory Signs: The X-ray examination of the stomach shows ulceration or a growth in the stomach or an obstruction at the pylorus. As a rule, however, the cancerous nature of the disease is not determined by the X-ray examination alone because an ulcer may give a similar appearance, but by a combination of characteristic stomach symptoms, general symptoms and X-ray signs.

The examination of the stomach contents after a test meal usually shows a diminution or a complete absence of hydrochloric acid in the stomach, and the retention of food previously eaten. In addition, the stomach contents often contain sarcinæ, a form of fungus, which is merely an indication of putrefaction. To determine retention, a patient is given a bowl of rice and raisins the night before the test meal. The stomach contents will contain the undigested raisins.

As the disease progresses the blood shows signs of a very severe secondary anemia: diminished red blood cells and hemoglobin.

Complications

The most common complications of cancer of the stomach are hemorrhage and metastases.

Hemorrhage usually causes vomiting of blood, which is coffee ground in appearance. When the bleeding is severe clots are vomited, the pulse becomes rapid and collapse develops. The blood also appears in the stool, which has a black, tarry appearance.

Metastases are new cancerous nodules which develop in the lymph glands and in other organs, especially the organs in the abdomen. Metastases in the liver cause a large liver, jaundice and sometimes ascites, an accumulation of fluid in the abdomen. These symptoms result from obstruction of the portal veins at the base of the liver.

Treatment

Cancer of the stomach is treated by a surgical operation to remove as much of the stomach and involved lymph nodes as possible. The best results are obtained when the operation is performed in the very early stages of the disease, but it is sometimes difficult for the physician to diagnose the disease in this stage. Consequently most physicians advise an exploratory operation whenever there is a reasonable suspicion of cancer in a patient at the cancer age.

Unfortunately, in many cases the cancer is so extensive by the time the patient is operated upon that the stomach cannot be removed, and various palliative operations are performed. If there is an obstruction at the pylorus a new opening is made between the stomach and intestines. If the obstruction is at the cardiac end, the stomach is sewn to the abdominal wall and a permanent opening made for feeding purposes. X-ray and radium treatment is used when operation is impossible.

Palliative Measures: The cases that cannot be operated upon or when there is a recurrence, are given remedies to relieve the pain, usually morphine.

The vomiting and retention of food are treated by frequent lavage.

When hemorrhage occurs the patient is kept quietly in bed under the influence of morphine, an ice bag is applied to the stomach and small pieces of ice or cold liquids are given. Transfusion, horse serum or thromboplastin is given to stimulate clotting.

DILATATION OF THE STOMACH

Dilatation of the stomach is an enlargement or distention of the stomach. It occurs in two forms: acute dilatation and chronic dilatation.

Acute Dilatation of the Stomach

Acute dilatation of the stomach or sudden paralysis of the stomach is a rare condition which usually results from the shock of an operation, or follows anesthesia. It occasionally develops in the course of acute infectious diseases such as typhoid fever, or pneumonia.

Symptoms: The principal symptoms are sudden and continuous vomiting of large quantities of fluid, immediately after an operation. The abdomen becomes distended and collapse develops; rapid, thready pulse, slow, shallow breathing, pallor, etc.

Treatment: The condition is treated by washing out the stomach repeatedly with large quantities of warm water with or without bicarbonate of soda.

Chronic Dilatation of the Stomach

Chronic dilatation of the stomach is the most common form of dilatation. It is usually caused by obstruction at the pylorus as a result of a healed ulcer, adhesions, or cancer. It is sometimes caused by continued overeating or excessive drinking, especially when the stomach wall is naturally weak.

Symptoms: In mild cases the only symptoms are indigestion: fullness and distention after eating, and belching. In severe cases the patient vomits large quantities of undigested or putrefied food which has been retained in the stomach for days. X-ray examination will show the dilated stomach. The stomach contents contain retained food and mucus.

Treatment: Chronic dilatation is treated by limiting the quantities of food and by washing out the stomach frequently with large quantities of water and sodium bicarbonate. If the muscular coat of the stomach is weak, strychnine and other tonics are often given.

If the dilatation is the result of an obstruction at the pylorus a new opening is made between the stomach and duodenum by a gastroenterostomy operation.

ATONY OF THE STOMACH

Atony of the stomach is a weakened condition of the stomach muscles. As a result, the stomach is unable to empty its contents completely and becomes filled with partially digested food.

Symptoms: The chief symptoms are various symptoms of indigestion or dyspepsia: fullness, distention, belching, indefinite pains in the stomach, and constipation.

The patient also has poorly developed muscles throughout the body, weakness and anemia, and tires very easily.

Treatment: The patient is put on a diet consisting of small quantities of food given at frequent intervals to avoid distention. Tonics such as strychnine, iron and other substances are ordered. Exercise is advised to improve the general muscular tone of the patient. Sometimes frequent lavage is used to stimulate muscular contraction of the stomach.

GASTROPTOSIS

Gastroptosis is a displaced or low hanging stomach. It is usually part of a general visceroptosis, a condition in which all the organs in the abdomen, the intestines, the kidneys and sometimes the liver and spleen are displaced.

Cause: The condition is usually a congenital anatomical characteristic of certain types of individuals, thin, lanky, nervous persons with long extremities, prominent scapulæ, a narrow costal angle and poorly developed muscles, generally called asthenics to indicate their tendency to fatigue. Some physicians believe gastroptosis is sometimes acquired by overfeeding, repeated pregnancies, tight corsets or other factors.

Symptoms

In many cases there are no symptoms. When symptoms develop they may be divided into several groups: stomach symptoms, constitutional symptoms, personality characteristics and nervous symptoms.

The stomach symptoms are variable. Frequently there is an excessive secretion of hydrochloric acid in the stomach which causes pain and cramps in the stomach. As a rule the pains are not typical. Some patients complain of fullness, discomfort after meals, distention and belching; because undigested food remains in the stomach and ferments. Loss of appetite and chronic constipation are other common symptoms. The X-ray will usually demonstrate the low hanging stomach, sometimes described as a fish hook or orthotonic stomach. The gastric contents often show increased secretion of hydrochloric acid.

The constitutional symptoms are attacks of intense exhaustion,

weakness and low blood pressure—usual characteristics of the type of patient. The patients remain thin for years and seldom gain in weight.

The asthenic patients have a characteristic personality. They are introspective, self-centered and think constantly of their illnesses and describe their symptoms in the minutest detail. They suffer from all sorts of fears and often have a sense of inferiority.

The nervous symptoms are often the most prominent symptoms. The patient complains of sleeplessness, palpitation of the heart, flushing of the face, rapid pulse, excessive perspiration, and aches and pains in various parts of the body.

Treatment

Gastroptosis is treated by abdominal belts, diet, rest and by remedies to relieve the stomach and nervous symptoms.

Some physicians believe the symptoms of gastroptosis can be relieved by elevating the stomach. They therefore advise the patient to wear special abdominal belts or corsets to raise the stomach. Sometimes the abdomen is strapped with adhesive plaster in a special manner.

The stomach symptoms are treated in the same manner as gastric or duodenal ulcer. The patient is put on a high caloric diet consisting principally of milk, cream and eggs, given at frequent intervals, to which other proteins and simple foods are gradually added. The remedies usually given for the stomach symptoms are alkalies, bismuth and similar remedies.

The nervous symptoms are treated by a rest cure, by sedatives, hydrotherapy and massage. The patients should be taught to relax and to develop confidence in themselves. They should develop a hobby and become interested in various mental and physical diversions.

FUNCTIONAL DISORDERS OF THE STOMACH

Functional disorders of the stomach are diseases in which a careful examination by the physician reveals no evidence of any organic disease of the stomach. In spite of the normal structure of the stomach the patient has severe symptoms of disturbed gastric function.

Functional disorders of the stomach are sometimes called gastric neuroses or nervous dyspepsia because the patients suffering with this form of stomach disease usually complain of various nervous symptoms.

Nervous Mechanism of the Stomach: The function of the stomach is to secrete gastric juice and to propel the food into the intestines by its muscular contractions. It is modified and controlled by a set of nerves known as the autonomic nerves, along which impulses pass as the result of psychical, emotional or other stimuli. The autonomic nerves consist of two sets: (1) branches of the sympathetic nerves and (2) branches of the vagus nerves. The sympathetic nerves check stomach function and the vagus nerves stimulate its function.

Cause: The cause of functional gastric disorders is not definitely known. The condition is more common among persons of a certain build and personality who usually also have gastroptosis; the thin, nervous persons already described, who suffer from undue fatigue and have a highly sensitive and irritable nervous system. It is more common in younger, high-strung individuals, and especially in women. Sometimes gastric neuroses develop after a mental shock or nervous strain or continual worry. There is no doubt that hard work, irregular meals, poor food and irritants are sometimes causative factors. Certain forms of secretory disturbances are sometimes congenital.

Symptoms

The symptoms may be divided into three groups:

1. Nervous Symptoms.
2. Subjective Gastric Symptoms.
3. Objective Gastric Symptoms.

Nervous Symptoms: The nervous symptoms are usually characteristic, and are the same in all forms of functional diseases. The patient is anxious, worrisome, introspective and talks at great length about the symptoms and often analyzes them minutely. He usually complains of palpitation of the heart, undue fatigue, headache, dizziness, sleeplessness, excessive perspiration and poor circulation. The patients do not gain weight readily and they sometimes lose weight.

Subjective Gastric Symptoms: The subjective stomach symptoms are variable and indefinite: loss of appetite, fullness and discomfort, a sense of pressure, belching of gas, indefinite pains in the stomach, difficulty in swallowing, sometimes nausea and

vomiting, and constipation. Many patients also have symptoms of specific forms of secretory or motor disturbances.

Objective Stomach Symptoms: The patient usually shows all the signs of the nervous temperament; rapid pulse, flushing of the face, cold cyanotic hands, etc., and tenderness in the upper part of the abdomen.

The examination of the stomach contents may show a normal gastric juice, an excessive amount of hydrochloric acid or diminished hydrochloric acid. If the patient has hypermotility, the gastric contents will pass into the intestines too rapidly. This is usually indicated by the fact that no stomach contents are obtained unless the stomach tube is passed a very short time after a test meal.

The X-ray examination may show the characteristic motor disturbance, that is, excessive peristalsis, or an atony or dilatation of the stomach.

The physician usually attempts to eliminate all possible causes for the gastric symptoms and it is only after the elimination of such causes as pregnancy, chronic nephritis, gall-bladder disease, thyroid disease, etc., that the symptoms are considered to be due to gastric neuroses.

Clinical Forms

Functional disorders of the stomach all have the same nervous symptoms and subjective gastric symptoms. They frequently vary, however, according to the specific type of secretory or motor disturbance in the stomach. In some cases the secretion of hydrochloric acid is increased, in others it is diminished. Some cases have increased peristalsis, others diminished peristalsis. We may therefore classify the functional disorder of the stomach or gastric neuroses as follows:

1. Functional Secretory Disturbances.
   - (a) Hypersecretion.
   - (b) Hyperchlorhydria.
   - (c) Achylia Gastrica or Subacidity.
2. Functional Motor Disturbances.
   - (a) Hypermotility.
   - (b) Cardiospasm.
   - (c) Nervous Vomiting.
   - (d) Air Swallowing.
3. Functional Sensory Disturbances.
   - (a) Gastralgia.

Secretory Disorders

Hypersecretion is a condition in which there is a continual secretion of gastric juice during and between meals. It causes a constant gnawing pain in the stomach and sometimes vomiting of large quantities of extremely sour stomach contents. In addition the patient has the usual subjective symptoms and nervous symptoms of functional gastric disorders.

Hyperchlorhydria is a condition in which there is excessive secretion of hydrochloric acid at meal times or when food enters the stomach. It causes severe pain directly after or within an hour after eating. This is associated with the usual subjective gastric and nervous symptoms of functional stomach disorders.

Achylia Gastrica is a condition characterized by a marked diminution in the secretion of gastric juice and an almost complete absence of hydrochloric acid and pepsin.

The hydrochloric acid is usually also diminished in pernicious anemia and in cancer of the stomach. Functional achylia gastrica is a constitutional or congenital condition and often develops after undue nervous strain, worrying or hard work.

The patients are sometimes free from symptoms for years. The characteristic symptoms are attacks of cramplike pain in the stomach, which occur almost directly after meals, followed in about three or four hours by abdominal cramps and diarrhea. The stools usually contain many particles of undigested food, and a good deal of mucus. Occasionally the diarrhea is absent, but instead the patient has a sense of fullness after eating, distention and constipation. The patients frequently have a great craving for salt.

The stomach contents contain very little free hydrochloric acid and frequently no pepsin.

Motor Disorders

Hypermotility is a condition characterized by excessive peristalsis of the stomach. It is frequently associated with hyperacidity. The chief symptoms are severe cramplike pains in the stomach.

Cardiospasm is a spasm of the cardiac opening of the stomach, a condition in which the patient is unable to swallow solid or semi-solid food. It causes severe pain in the pit of the stomach on swallowing.

Pylorospasm is a spasm of the pylorus. It causes severe cramplike pain in the stomach, about one-half hour after eating.

It sometimes occurs in infants and causes regurgitation of food after feedings or continual vomiting.

Aerophagia is a nervous condition characterized by swallowing air continuously. As a result the patient belches gas constantly.

Nervous vomiting is a common symptom of gastric neuroses. It is characterized by vomiting of large quantities of fluid whenever the patient is under a nervous strain.

Sensory Disturbances

Gastralgia is pain in the stomach. It occurs in all forms of gastric neuroses and in organic diseases of the stomach.

Treatment of Functional Disorders

The treatment of functional disorders of the stomach or gastric neuroses may be divided into two parts: (1) treatment of the nervous symptoms, (2) treatment of the stomach symptoms.

Treatment of Nervous Symptoms: A functional disturbance in the nervous system is the underlying cause of all gastric neuroses. When the underlying nervous condition is improved the stomach symptoms usually improve at the same time. The severe cases should be kept in bed on a rest cure.

The nursing care of functional disorders is quite an art and only the nurse who can understand these patients can do much with them. The nurse should do everything in her power to accentuate the patient's personality and she should be very attentive, because this type of patient thrives on attention. The surroundings should be quiet and comfortable and the patient's mind should be diverted from the illness.

If possible, psychical factors such as cares or worries or emotional upsets should be eliminated. In actual practice, however, there are frequently irritating conditions in the patient's life which are not amenable to treatment by the physician or nurse. Sometimes time alone may alleviate the psychical irritation.

As a rule a high caloric diet consisting principally of milk, eggs and cream is advised to increase the patient's weight. Massage, passive exercise, cold baths and packs and training in relaxation are other methods employed. To relieve the nervous irritation sedatives such as bromides, luminal, valerian and similar remedies are given.

Treatment of Gastric Symptoms: The stomach symptoms

are treated by diet and remedies which vary according to the type of functional disturbance.

Hyperacidity or Hyperchlorhydia and Hypersecretion is treated like gastric ulcer. The diet usually consists of milk, cream, and eggs, given at frequent intervals. Gradually cereals, cooked vegetables in purée form, chicken, and other simple foods are added. Raw vegetables, coffee, tea, salt, condiments and dressings should be avoided.

The remedies usually given are alkalies, sodium bicarbonate, magnesia, bismuth or calcium preparations to neutralize the excess of acid and belladonna or atropine to lessen secretion, and spasm and laxatives for the constipation.

Achylia gastrica or subacidity is treated by an appropriate diet and by various remedies. The diet consists principally of carbohydrates, cereals, potatoes, cooked vegetables in purée form, milk, buttermilk, Acidophilus milk and fruit juices such as orange juice. Gradually soft-boiled eggs and chicken is added. The food should be well cooked or mashed. The patient should chew the food thoroughly. Protein foods and coarse vegetables are usually eliminated.

The medicines usually given are dilute hydrochloric acid, pancreatic extract, strychnine and various bitters such as cinchona or gentian. Dilute hydrochloric acid is given well diluted by sipping through a glass tube before meals. Pancreatic extracts are given with bicarbonate of soda after meals to carry on digestion in the stomach. Diarrhea is treated by dilute hydrochloric acid and tannic acid preparations such as tannigen. Pankreon, a mixture of pancreatic extract and tannic acid, is frequently given.

Hypermotility, cardiospasm and pylorospasm are treated by atropine, belladonna or sedatives, and by the usual measures to relieve the nervous symptoms.

Aerophagia is treated by training the patient to check the habit, by sedatives and by treating the underlying nervous condition.

Nervous vomiting is treated by sedatives to relieve the underlying nervous condition.

Gastralgia is treated by various methods and remedies according to its cause.

CHAPTER XXIV

DISEASES OF THE INTESTINES

Physiology of Intestinal Tract

The intestinal tract is a long, muscular tube about thirty feet in length which begins at the pylorus and ends at the anus. It is divided into the small intestine and large intestine.

The small intestine is about twenty feet in length and may be indefinitely divided into the duodenum, the jejunum and the ilium. The duodenum or first portion of the small intestine is about a foot or a foot and a half in length and is fixed to the back of the abdomen around the head of the pancreas. The jejuunum and ilium form the rest of the small intestine. The ilium is similar to the jejuunum, but it contains numerous lymph follicles known as Peyer's patches in its wall. It joins the beginning of the large intestine or cecum. The ileocecal valve is a valve situated at the opening between the small and large intestine.

The large intestine or colon is divided into several parts: the ascending colon situated in the right side of the abdomen, the transverse colon, which extends transversely across the abdomen, the descending colon situated in the left side of the abdomen, and the terminal parts, the sigmoid flexure, rectum and anus.

The function of the small intestine is to complete the process of digestion and to absorb the digested food into the blood stream. The digestion of food is completed in the upper part of the small intestine, particularly in the duodenum, by the pancreatic juice, bile and intestinal juice. The process has already been described, see page 288. It is not at all unlikely that some digestion of food takes place in the intestinal tract as the result of bacterial action, because there are always numerous bacteria in the intestinal tract, both useful and injurious. The intestinal contents are passed along the small intestine by peristalsis or contraction of its muscle, and the water of the undigested food is gradually absorbed into the blood stream. The residue or undigested material gradually accumulates in

the large intestine, where it forms fecal masses and is expelled as stool.

Symptoms of Intestinal Diseases

The most common symptoms of diseases of the intestines are constipation, diarrhea, pain, tympanites, tenesmus and changes in the character of the stools. The physician is also able to recognize diseases in the intestines by various objective signs, by X-ray and proctoscopic examination and by examination of the stools.

Constipation: Constipation is a delay or difficulty in moving the bowels. It is usually associated with the passage of hard, well-formed stools. Prolonged constipation usually causes abdominal distention, headache and dizziness, as a result of putrefaction and fermentation of retained intestinal contents.

Diarrhea: Diarrhea is increased frequency of bowel movements. When the diarrhea is mild the patient has frequent well-formed stools. When it is severe the bowel movements are very numerous, the stools are fluid in character and are usually associated with colic, severe cramplike pain in the abdomen. If diarrhea is severe and prolonged symptoms of collapse gradually develop; a rapidly thready pulse, weakness, shallow breathing and cold perspiration, etc.

Pain: Pain is frequently a symptom in diseases of the intestines. It is usually a characteristic cramplike pain or colic, caused by spasm or contraction of the intestines. It usually occurs in the part of the abdomen where the diseased organ is situated. For example, in acute appendicitis the pain is situated in the right lower quadrant of the abdomen. The pain sometimes occurs all over the abdomen at first and then becomes localized to the area where the diseased organ is situated.

Tympanites: Tympanites is distention of the intestines by accumulation of gas. The small or large intestine or both may become distended and the patient often passes a good deal of gas through the rectum. Tympanites is usually produced by excessive fermentation and putrefaction in the intestines, especially when the intestinal muscle is weakened. It is one of the most common complications in infectious diseases and is produced by the severe toxemia which weakens or paralyzes the intestinal muscle and by bacterial fermentation and putrefaction.

Tenesmus: Tenesmus is a constant desire to move the bowels, but the effort is painful and not effective. It usually occurs in severe diarrhea and in diseases of the rectum.

Changes in Stools: Diseases of the intestines usually change

the character of the bowel movements. The character of the normal constituents may be changed or the stools may contain abnormal constituents. Normally the stool consists of dark brown well-formed masses. The fecal masses are sometimes unusually firm when the patient is constipated. In chronic intestinal obstruction the stools sometimes consist of unusually small round masses. In diarrhea the stools are usually fluid in character. The reaction of the stool may be acid or alkaline.

The abnormal constituents of the stool are undigested food, mucus, pus, blood, parasites and uncommon forms of bacteria. Undigested food is frequently found in the stools in certain diseases—in diarrhea in infants, and in diseases of the stomach. Sometimes the undigested food can only be recognized microscopically. Mucus appears in the stool as strings or flakes, and in nervous diarrhea or mucous colitis the patient passes large formed masses of mucus. The appearance of blood in the stools varies according to the source of the bleeding. When the blood comes from the stomach duodenum or upper part of the small intestine, the stool has a thick tarry appearance. When the bleeding is severe and profuse the blood appears as clots. The blood which comes from the rectum or anus or from hemorrhoids is bright red in color like normal blood. Sometimes the blood occurs in such small quantities that the normal appearance of the stool is not changed. It can then be recognized only by chemical tests and is called occult blood. Intestinal parasites frequently occur in the stools. Segments of tape worms appear as small square flat pieces and sometimes large sections of the worm are passed. The eggs of various worms may be recognized by microscopic examination of the stool. Amebæ can only be found when the stool is examined microscopically at the bedside. The types of bacteria in the intestines are determined by elaborate bacteriological examination of the stool. Typhoid bacilli, dysentery bacilli and other bacteria are found in this way.

Special Methods of Examination

The physician frequently examines the intestinal tract by means of the X-ray and proctoscope.

X-ray Examination: The intestinal tract is examined with the X-ray to recognize obstructions or other diseases in the intestinal tract. The X-ray pictures will show the outline of the intestines after they are filled with bismuth or barium preparations. The patient is prepared for the X-ray examina-

tion in the same manner as for stomach pictures. In addition X-ray pictures of the colon are taken after injecting a barium or bismuth emulsion into the rectum.

Proctoscopic Examination: The proctoscope is a long metal tube through which the rectum and sigmoid may be observed when the inside of the tube is illuminated by a small electric light.

The patient is prepared for proctoscopic examination by giving a cathartic the night before, and an enema the morning before the examination. The physician inserts the proctoscope into the rectum for a distance of twelve to eighteen inches. The instrument is then illuminated and the inside of the rectum can be observed as the tube is gradually withdrawn.

Symptoms to be Observed by the Nurse

When nursing intestinal diseases the nurse should observe and record the following symptoms:

1. The pain; its location, character, radiation and the measures which relieve it.
2. The number of stools during the day.
3. The character of the stools; whether they are solid or fluid.
4. The presence of abnormal constituents in the stool; whether it contains mucus, pus, blood and parasites.

DISEASES OF THE INTESTINES

Diseases of the intestines may be divided into the following groups:

1. Functional Disorders.
2. Organic Diseases.
3. Constitutional Conditions.

FUNCTIONAL DISORDERS

Functional disorders of the intestines are various conditions characterized by abnormal bowel movements; constipation and diarrhea.

CONSTIPATION

Constipation is a condition characterized by delayed and sluggish bowel movements usually associated with hard formed

stools. It is also called intestinal stasis or costiveness. It occurs in two forms: acute constipation and chronic or habitual constipation.

Acute constipation is usually a symptom in acute infections, especially at the onset, and in acute appendicitis.

CHRONIC CONSTIPATION

Chronic or habitual constipation is a very common disorder and is responsible for many and varied symptoms.

Cause

The causes of chronic constipation may be divided into two groups: (1) specific diseases, (2) general causes.

Specific Diseases: Constipation is frequently an important symptom in chronic appendicitis, chronic gall-bladder disease, hyperchlorhydria, tumors or bands in the intestines and other chronic diseases in the stomach or intestines.

General Causes: There are two kinds of constipation which result from general causes, (1) atonic constipation and (2) spastic constipation.

Atonic constipation is caused by a diet containing insufficient roughage or residue, by failure to move the bowels regularly, by a weakened condition of the intestinal muscles, and by anemia or malnutrition. Sedentary habits and lack of exercise tend to develop weak intestinal muscles.

Spastic constipation is a form of constipation caused by spasm or contractions of parts of the intestinal tract. As a result, the passage of stool becomes obstructed at the site of the spasm. The condition occurs especially in nervous patients who have a general tendency to spasms in other abdominal organs, especially the stomach.

Obstipation is a very severe form of chronic constipation in which it is almost impossible to move the bowels. The stools of such cases may be so hard that they can only be removed from the rectum with an instrument.

Symptoms

The characteristic symptom is inability to move the bowels. Some patients go for days without moving the bowels. When bowel movements occur the stool consists of hard, well-formed masses. The accumulated feces in the intestines putrefy and

ferment and form various poisons. As a result abdominal pains and tympanites develop. Distention and belching occur and the urine contains indican. Constant absorption of poisons often causes headache, loss of appetite, dizziness, lack of energy, and sometimes chronic arthritis and neuritis.

In the spastic form of constipation the patient frequently gets severe colicky pains in the abdomen. In obstipation impacted fecal masses may cause an obstruction which produces severe abdominal pain, nausea and vomiting.

Treatment

Acute constipation is usually treated by a brisk purgative such as calomel, citrate of magnesia, castor oil, etc., an enema or a colon irrigation. The bowel movements usually become normal as soon as the infection subsides or the cause is removed.

Chronic or habitual constipation is treated by various methods according to the cause. The constipation of gall-bladder disease, chronic appendicitis, or diseases of the intestines improves when these conditions are successfully treated. When treating such cases the physician usually modifies the diet and sometimes gives cathartics to relieve the constipation.

Atonic constipation is treated by developing proper habits; by a suitable diet, by various measures which improve the muscular tone of the bowels, and by laxatives.

The patients are usually advised to try to move the bowels for a half hour on arising every morning. At first the effort is not successful, but gradually regular bowel movements result.

Diet: Dietary treatment consists of a well-balanced diet and foods containing large quantities of roughage, which distend the intestines and causes bowel movements. The diet usually ordered contains meats, fats and uncooked vegetables, salads lettuce, tomatoes, celery, asparagus, cabbage, spinach, string beans, and fruits such as apples, oranges, prunes, plums and peaches. Various breads such as whole wheat bread, bran muffins and acidophilus milk and yeast are popular foods for constipation. Large quantities of water taken at frequent intervals are also beneficial.

Exercise and Massage: The patient is usually advised to take open-air exercises, especially exercises which strengthen the abdominal muscles. Massage of the abdomen with a large heavy rubber ball or with special forms of apparatus frequently improves the muscular tone of the intestinal muscles and aids bowel movements.

Remedies: The usual remedies for chronic constipation are laxatives and cathartics and tonics to improve the tone of the intestinal muscles. In spastic constipation remedies are given to relax intestinal spasm.

The best laxatives in chronic constipation are mineral oil, agar agar, olive oil, psyllium seeds and flax seeds. These substances act mechanically and are not irritating. Mineral oil lubricates the intestine and lessens absorption, thus increasing the volume of stool. Agar agar, psyllium seeds and flax seeds absorb fluid, distend the bowels and thereby cause bowel movements. There are numerous mixtures of mineral oil or agar agar combined with various laxative drugs, such as petrolagar, agarol, etc. Laxative drugs such as phenolphthalein, cascara, rhubarb or podophyllin and similar substances are frequently ordered. They should not be used continuously because they tend to irritate the intestines. Olive oil enemas, soapsud enemas, or colon irrigations with bicarbonate of soda are often ordered, especially when the patient has toxic symptoms from absorption of poisons.

The weakened intestinal muscles are treated by strychnine, iron, arsenic, and other tonics.

Spastic constipation is treated by atropine or belladonna which are often combined with mild laxatives. In addition, the nervous symptoms are treated by rest, sedatives, overfeeding and psychical methods.

Obstipation is treated by large doses of active purgatives, calomel, compound cathartic pills and similar remedies. Frequently, however, the stool is removed from the rectum by mechanical means.

DIARRHEA

Diarrhea is a symptom characterized by frequent fluid bowel movements. It occurs in two forms: acute diarrhea and chronic diarrhea.

Acute Diarrhea

Cause: Acute diarrhea is caused by eating excessive quantities of food or decayed food, especially bad shell fish, eggs, milk or unripe fruits and vegetables. It is also caused by acute intestinal infections by various bacteria.

Symptoms

The patient suddenly develops severe griping abdominal pains

and frequent bowel movements, loss of appetite, a rise in temperature and abdominal distention. At first there are five or six light brown loose movements a day which contain undigested food and mucus and have a foul odor. Gradually the stools increase in number, sometimes to as much as twenty a day, and consist of fluid containing mucus. As a result of losing large quantities of fluid by diarrhea the symptoms of collapse develop: rapid thready pulse, weakness, pallor, cold dry skin and shallow breathing.

Treatment

Acute diarrhea is treated by rest in bed, a suitable diet and remedies to check the diarrhea. During the first twenty-four hours no food is allowed, but small quantities of warm water or weak tea are given at frequent intervals. Gradually broths, soups and cereals, toast, boiled milk and eggs are added.

Some physicians order a cathartic such as castor oil or calomel at the onset. The remedies used to check the diarrhea are bismuth, tannic acid preparations and opium, especially paregoric. Colon irrigations are often given to clear the intestines of infectious material. The collapse is treated by forcing fluids and various stimulants.

Chronic Diarrhea

Chronic diarrhea is caused by the following conditions:

1. Chronic intestinal infections, colitis, ulcerative colitis, tuberculosis, syphilis, or cancer of the intestines.
2. Diseases of the stomach, especially achylia gastrica.
3. Exophthalmic goiter.
4. Functional diseases of the nervous system.

Symptoms

The diarrhea may be continuous or occur in attacks. The patient has three to five bowel movements a day with very little griping. The stools contain mucus and undigested food. In achylia gastrica the diarrhea occurs in attacks, usually several hours after meals. When the diarrhea is caused by various forms of colitis, the patient has tenesmus and the stools contain blood.

Nervous diarrhea is a form of diarrhea which occurs in nervous patients. It is characterized by frequent bowel movements and the stools contain large quantities of mucus.

Treatment

The treatment of chronic diarrhea depends on the cause. When it is due to colitis it is treated by a simple diet in which coarse vegetables and meats are eliminated, by colon irrigations with antiseptic solutions, and by other methods. When the diarrhea is caused by achylia gastrica it is treated by a suitable diet consisting principally of carbohydrates, by dilute hydrochloric acid or pancreatin and intestinal astringents.

The diarrhea of exophthalmic goiter usually subsides when the condition is relieved by medical or surgical treatment. Sedatives, pancreatin, bismuth and similar astringents are the remedies used.

Nervous diarrhea is treated by sedatives and by a rest cure.

Diarrhea in Infancy

Diarrhea is a very common condition in infancy and early childhood. The cases may be divided into two groups according to the cause: acute intestinal indigestion and intestinal infections.

Acute Intestinal Indigestion

This form of diarrhea occurs especially in the summer months among artificially fed infants who live in poor hygienic surroundings. It usually results from milk of poor quality or from a diet which contains too much sugar or fat. In older children the diarrhea is caused by eating unripe fruits and vegetables.

Symptoms: The symptoms usually begin suddenly with vomiting and a rise in temperature to 102° or 103° F. This is followed by frequent bowel movements, about five or ten a day, and griping pains. The stools are liquid, they have a foul odor, and contain mucus and curds.

Intestinal Infections

The severest form of diarrhea in infancy is caused by intestinal infections with specific germs, the dysentery bacillus, the streptococcus or the gas bacillus. It occurs especially among artificially fed children in the summer.

Symptoms: The symptoms begin suddenly with severe vomiting and a rise in temperature to 103° to 105° F., diarrhea, colic, tenesmus and tympanites. The stools are very numerous, as many as twenty a day, and are fluid, containing a great deal of mucus, and often blood. As the diarrhea continues, the

patient becomes emaciated, pale and weak and develops the symptoms of collapse from loss of fluid. The condition usually lasts a week or ten days and in severe cases delirium and even coma develop.

Cholera infantum is a rare and very severe form of diarrhea which occurs in infancy. It is characterized by a sudden onset of profuse vomiting and diarrhea. The stools are very numerous and consist of an acid irritating fluid resembling rice water, which often contains blood. The temperature is usually high, 105° or 106° F., and the child may develop severe nervous symptoms, develop coma or collapse and die in a few days.

Complications: Acidosis, a condition characterized by deep respiration, cyanosis, drowsiness and other nervous symptoms, is sometimes a complication of severe forms of diarrhea.

Treatment

Prevention: Diarrhea in infants can be prevented if proper care is used in keeping the milk supply free from bacteria, by pasteurization and other methods. The children should have plenty of sunshine and fresh air and be suitably clothed according to the weather.

Dietary Treatment: The diet is usually the principal treatment. As a rule milk is stopped for about forty-eight hours, but water is given frequently in moderate quantities. The child is then given small quantities of boiled skimmed milk or protein milk. Gradually cereals and sugar are added. As the diarrhea improves other simple foods are added.

Medicines: Some physicians order a cathartic such as castor oil or calomel at the onset. Bismuth preparations and sometimes tannic acid compounds are given to check the diarrhea. Paregoric is sometimes ordered to relieve the colic. Colon irrigations are used to remove infectious or irritating material from the intestines.

ACUTE ENTERITIS

Acute enteritis is an acute inflammation of the small intestine. The large intestine is frequently affected at the same time and the disease is then called enterocolitis or ileocolitis. The disease is frequently associated with an acute inflammation of the stomach and is called acute gastroenteritis.

Cause: The disease is prevalent among infants and young

children during the summer months. It is usually caused by various bacteria which are contained in contaminated foods, especially milk. It also results from eating unripe fruits or vegetables or meats and fish, olives or canned foods. Cholera morbus is a very severe form of enteritis caused by eating unripe fruits or vegetables.

Specific Enteritis: There are certain forms of enteritis which are caused by specific bacteria and are therefore described as specific infectious diseases. Typhoid fever is a form of enteritis caused by the typhoid bacilli. Bacillary Dysentery is a form of enteritis caused by the Dysentery bacillus. Cholera is a very severe form of enterocolitis caused by a specific germ, the Cholera vibrio.

Pathology: The disease process is a severe inflammation of the mucous membrane. It is markedly swollen, covered by flakes of mucus and sometimes hemorrhages develop.

Symptoms

The symptoms usually begin suddenly with vomiting and a rise in temperature to 103° or 104° F. This is followed by diarrhea, which is the chief symptom. The bowel movements are very frequent, five or six a day and in severe cases even more. They are usually accompanied by severe cramplike pains in the abdomen, and tenesmus, a desire to pass stool even when the intestines are empty. The stools contain undigested food, curds, mucus or pus. In severe cases they contain blood or flakes of mucous membrane. The abdomen is usually distended by tympanites. As the result of losing large quantities of fluid by severe diarrhea the symptoms of collapse gradually develop: weakness, exhaustion, thirst, pale, dry skin, rapid, weak, thready pulse, slow, shallow breathing. Acidosis is a frequent complication especially in children. In severe cases the patient may die of collapse.

Treatment

Acute enteritis is treated by preventive measures, by diet, remedies and local measures.

Prevention: Acute enteritis may be prevented in infants by giving them only the best quality milk or pasteurized milk and by proper hygiene which includes plenty of fresh air and sunshine. The disease may be prevented in adults by avoiding unripe fruits and vegetables and foods of poor quality.

Diet: At the onset the patient is usually starved for a day

or two, but is given plenty of fluid. A diet of broths, soup, barley or albumin water is then given. Gradually diluted pasteurized milk and barley gruel, soft boiled eggs and other simple foods are added as the diarrhea subsides.

In children all milk is stopped and they are given albumin water, barley water, or protein milk.

Medication: It is customary to administer some cathartic such as castor oil or calomel at the onset of the illness to remove all irritating substances from the bowels. The diarrhea is treated by bismuth and tannic acid preparations, such as tannalbin and other astringents. In severe cases opium preparations are usually given, especially paregoric.

Local Remedies: Colon irrigations with large quantities of water and bicarbonate of soda are given frequently to clean the bowels of all infectious material and all irritants. The tympanites and cramps are treated by turpentine stupes or other warm local applications.

DISEASES OF THE COLON

The most common diseases of the colon are colitis and cancer.

COLITIS

Colitis is an inflammation of the colon. It usually occurs in two forms: (1) Acute colitis, (2) Chronic colitis.

Acute colitis is usually part of acute enterocolitis, caused by various bacteria, the Dysentery bacilli, the Streptococci and others. It is characterized by severe diarrhea with fluid stools containing mucus, pus and blood, and in severe cases the symptoms of collapse. It has already been described.

CHRONIC COLITIS

Chronic colitis is a chronic inflammation of the large intestine usually characterized by ulcer formation. The disease occurs in several forms as follows:

1. Chronic Ulcerative Colitis.
2. Mucous Colitis.
3. Amebic Colitis.
4. Tuberculous Colitis.

Chronic Ulcerative Colitis

Cause: The cause of the disease is unknown. It occurs especially in young persons who have a nervous temperament and suffer with spastic constipation. It occasionally follows acute colitis. Some physicians believe the disease results from chronic bacterial infections of the intestines.

Pathology: The disease process is a severe inflammation of the colon. The membrane becomes swollen and thickened and frequently numerous small ulcers develop on its surface.

Symptoms

The chief symptoms are diarrhea, progressive loss in weight and strength and severe anemia.

The diarrhea is very severe and may develop suddenly or gradually. It is often preceded by spastic constipation. The patient has numerous fluid stools, about fifteen to twenty a day, which are usually accompanied by severe griping pains and tenesmus. The stools contain mucus, pus and blood. When the rectum and sigmoid are examined with a proctoscope the physician notes the severely inflamed colon and numerous ulcers. X-ray examination often demonstrates spasm in various parts of the large intestine.

Mucous Colitis

Mucous Colitis is a disease characterized by secretion of large quantities of mucus from the large inestine.

Cause: The disease occurs in neurasthenic or hysterical persons who have visceroptosis and suffer from spastic constipation.

Symptoms: The characteristic symptoms are sudden attacks of severe abdominal cramps followed in several hours by the passage of large quantities of mucus. The mucus may be large flakes or strings mixed with the stool or it may be passed as large casts of the intestine. There are usually no symptoms between the attacks except constipation and abdominal distention. The patient also has other symptoms of neurasthenia and frequently loses weight and strength from continued diarrhea.

Amebic Colitis

Amebic Colitis is a form of chronic colitis which is prevalent in tropical countries and is caused by the ameba. The disease

is characterized by ulcers in the large intestine. The symptoms are abdominal cramps and diarrhea. The stools contain blood, pus and the ameba. It is described with tropical diseases, see page 153.

Tuberculous Colitis

Tuberculous colitis is a form of chronic colitis caused by the tubercle bacillus which sometimes occurs in long standing cases of pulmonary tuberculosis. The disease is characterized by ulcers in the large intestine. As a result the patient develops severe diarrhea, marked loss in weight and the general symptoms of tuberculosis. The stools are liquid and contain mucus, pus, blood and tubercle bacilli.

Treatment of Colitis

Acute colitis is treated like acute enteritis or entercolitis, see page 331.

Chronic colitis is treated by careful nursing, by diet, by various remedies and by special methods which vary according to the cause.

Nursing Care: The patient should be kept in bed and quiet because nervous irritability is an important predisposing factor. A hot-water bag or other warm application is usually applied to the abdomen after each meal.

Diet: The diet consists of foods which contain very little residue. Meats, fish and coarse or raw vegetables are therefore not allowed. At first boiled or peptonized milk, barley, rice, farina or other similar foods, and plenty of water are given. As the disease improves other suitable foods are added such as broths, creamed soups, eggs, bacon, bread and butter, noodles, spaghetti, cooked vegetables—in purée form—and small portions of chicken, tender meat, stewed fruit and custard and various jellies.

Medicines: The diarrhea is often treated by bismuth or tannic acid preparations, and sometimes by atropine. When there is deficient hydrochloric acid in the stomach, dilute hydrochloric acid is given or pancreatin and sodium bicarbonate. The underlying nervous symptoms are treated by luminal and sedatives such as bromides. When the colitis improves, mild laxatives such as mineral oil, phenolphthalein, agar agar or cascara and sometimes castor oil are given to remove irritating material from the colon.

Local Treatment: The severe cases are treated by colon irrigations of normal salt solution or solutions of silver nitrate,

argyrol, acriflavine, acriviolet or other antiseptics. The irrigations must be given gently with the patient lying flat on the back and the pelvis elevated. The tube is inserted two or three inches into the rectum and the bag elevated about two or three feet above the level of the bed. Tenesmus is treated by starch enemas. In some cases vaccines made from the bacteria in the colon are given by hypodermic injection.

Treatment of Specific Forms: Mucous colitis is treated by a rest cure and sedatives such as luminal, bromides and by atropine. Tuberculous colitis is treated like other forms of colitis in addition to the methods of treatment used in tuberculosis. Amebic colitis is treated by emetine given by mouth or by injection and colon irrigations with quinine. In addition the methods employed in other forms of colitis are used.

Surgical Treatment: When medical treatment is unsuccessful various surgical operations are performed, such as colostomy, appendicostomy or ilecolostomy.

Colostomy is an operation which consists of sewing the cecum into the abdominal wall and leaving an opening into the colon through which bowel movements occur. This prevents stools from passing over the inflamed or ulcerated colon, thereby allowing the colitis to heal.

Appendicostomy is an operation which consists of sewing the appendix into the abdominal wall and leaving the stump open. The entire colon is then irrigated through the appendix stump with antiseptic solutions to stimulate healing.

Ileocolostomy is an operation whereby the ileum is sewn to the large intestine to prevent stool from passing through the inflamed colon.

APPENDICITIS

The appendix is a rudimentary organ attached to the end of the cecum or first part of the large intestine. It has apparently no function, but frequently becomes inflamed or diseased. Appendicitis is an inflammation of the vermiform appendix. It occurs in two forms: acute appendicitis and chronic appendicitis.

ACUTE APPENDICITIS

Acute appendicitis is an acute inflammation of the vermiform appendix.

Cause: The disease is caused by various germs which enter the appendix from the large intestine. It frequently results when the appendix becomes blocked by a small fecal mass.

Pathology: The appendix becomes acutely inflamed, congested and swollen and may contain pus. In severe forms the appendix becomes gangrenous because some of its fine arteries become blocked with small clots. The disease process may end by a spontaneous discharge of the pus into the colon or the appendix becomes distended with pus and ruptures slowly or rapidly. When it ruptures slowly an abscess develops. When the appendix ruptures rapidly or becomes gangrenous general or spreading peritonitis develops.

Symptoms

Acute appendicitis usually begins suddenly. The patient develops a sudden sharp severe pain in the right lower quadrant of the abdomen. The pain is severe and cramplike in character and is accompanied by vomiting. There is usually a rise in temperature, which is not very high, ranging around 100° or 101° F. or more, and a rapid pulse. Sometimes the attack begins with general abdominal cramps which become localized to the right lower quadrant of the abdomen in a few hours. The bowels are usually constipated.

When the physician examines the patient he usually finds tenderness and rigidity of the abdominal muscles in the right lower quadrant of the abdomen. As a rule the most tender spot is at McBurney's Point, situated midway between the navel and anterior superior spine of the ilium. If the appendix is abnormally situated extreme tenderness may be present in other parts of the lower abdomen or in the lumbar region. Acute appendicitis occurs in recurrent attacks and the first attack is usually followed by others.

Complications

The most common complications are abscess or peritonitis. A rare complication is subphrenic abscess or septicemia.

Abscess: An abscess develops in the right lower quadrant of the abdomen when the inflamed or gangrenous appendix perforates slowly or when the inflammation gradually extends to the neighboring structures. The symptoms of abscess are continuation of the temperature, tenderness and rigidity in the abdo-

men and a tender mass in the right lower quadrant of the abdomen.

Peritonitis: Peritonitis is the most serious complication of acute appendicitis. It is caused by sudden perforation of the appendix. As a result the pus is discharged into the abdominal cavity and peritonitis develops, which spreads over the entire abdomen.

The development of peritonitis is indicated by a marked increase in the severity and extent of the pain and areas of rigidity, vomiting, distention of the abdomen and an increase in the temperature and pulse rate. Gradually the characteristic symptoms of general peritonitis develop: the pinched expression, difficult breathing, rigidity and distention of the entire abdomen and a marked increase in the number of white cells and polynuclear cells in the blood.

Subphrenic abscess is a condition which develops when the infection extends upward to the liver. An abscess usually forms between the under surface of the diaphragm and the liver. The symptoms are continuation of the fever and pain in the right upper part of the abdomen, enlargement of the liver and X-ray evidence of the abscess.

Septicemia is a rare complication which usually begins with a thrombosis of the portal vein. The patient gets chills, fever and sweats and all the usual symptoms of septicemia follow.

Treatment

The treatment may be medical or surgical.

Medical Treatment: An attack of acute appendicitis frequently subsides and the patient becomes entirely normal, usually within a week. The patient is kept in bed absolutely quiet and an ice bag is applied to the right lower quadrant of the abdomen over the region of the appendix. A diet of light simple foods, principally fluids, is given to avoid intestinal irritation. It is important for the nurse to observe any change in the patient's condition such as a sudden rise in temperature or pulse rate, an increase or extension of the pain, the occurrence of abdominal distention or vomiting, etc. She should report any of these symptoms to the physician at once because they may indicate the onset of a complication.

As a rule no cathartics or enemas are given because the peristalsis, started by bowel movements, increases the tendency to perforation. Constipation in acute appendicitis is beneficial because the diminished peristalsis keeps the bowels at rest and

promotes healing of the inflammation. When the attack has subsided gentle bowel movements are started by mild laxatives or low enemas.

Surgical Treatment: It is generally agreed that the best treatment for acute appendicitis is to remove the appendix. As a rule an acute appendicitis is operated as soon as a diagnosis is made, unless the acute attack is subsiding when the operation is performed after the attack. If peritonitis has already developed the patient should be operated upon immediately, and the sooner the operation is performed the better is the outcome.

The complications are treated by surgical methods. A subphrenic abscess is opened and drained. Septicemia is treated in the usual manner.

CHRONIC APPENDICITIS

Chronic appendicitis is a chronic inflammation of the vermiform appendix.

Cause: The disease may result from repeated attacks of acute appendicitis or from chronic constipation.

Pathology: Repeated attacks of acute inflammation cause ulceration and scar formation within the appendix. As a result the appendix becomes thickened and its lumen is often obstructed. When the appendix is continually engorged with blood as in chronic constipation it also becomes thickened and changed to scar tissue.

Symptoms

The typical symptoms of chronic appendicitis are repeated attacks of acute appendicitis characterized by sudden pain in the right lower quadrant of the abdomen, with vomiting, a slight rise in temperature and constipation. As a rule the attacks are mild, but they gradually increase in frequency. This form of appendicitis is sometimes called chronic recurring appendicitis.

In some cases there are no typical attacks, but the patient has all sorts of reflex symptoms: fullness, indigestion, repeated attacks of vomiting, constipation, pains in the lower part of the abdomen, or the usual gastric symptoms of hyperacidity. The physician usually elicits distinct tenderness on pressure in the right lower quadrant of the abdomen.

Treatment

The treatment of chronic appendicitis may be medical or

surgical. Medical treatment consists principally of the methods used in treating chronic constipation, see page 325.

When medical treatment is not effective the appendix is removed by a surgical operation.

INTESTINAL OBSTRUCTION

Intestinal obstruction is an obstruction in the intestines which prevents the passage of their contents. The obstruction may be partial or complete and both forms may be acute or chronic.

Acute intestinal obstruction occurs suddenly and chronic intestinal obstruction develops gradually.

Acute Intestinal Obstruction

Cause: The cause of acute intestinal obstruction may be organic or functional.

The most common organic cause is a strangulated hernia. It may also be caused by a kinked loop of intestine or adhesions, volvulus or intussusception.

Volvulus is twisting of a loop of intestine.

Intussusception is infolding of a loop of intestine.

The functional causes are paralysis of the intestines by the poisons of infectious diseases such as pneumonia or typhoid fever or by the shock of an operation or anesthesia.

Pathology: The obstruction may develop in the small intestine or the large intestine. The constricted part of the intestine becomes swollen and engorged with blood and the loops of intestine above the obstruction are distended. If the obstruction is not relieved the affected part of the intestine becomes gangrenous and peritonitis results. In functional obstruction the entire intestinal tract is paralyzed and distended.

Symptoms

The symptoms develop suddenly. The patient complains of severe sudden cramps in the abdomen or in the hernial sac if the obstruction is due to a strangulated hernia. This is followed by continuous vomiting of undigested food, mucus and bile. If the obstruction is complete the vomited material becomes fecal in character and the patient vomits profuse quantities of liquid stool having a foul odor. The fecal vomiting is caused by the accumulation of intestinal contents into the stomach. When the intestinal contents cannot pass the obstruction, the

wave of intestinal contraction becomes reversed and the fecal matter is emptied into the stomach and vomited. The bowels are usually markedly constipated and in complete obstruction they cannot be made to move by cathartics or by enemas. The administration of cathartics usually increases the severity of the cramps, the vomiting, and all the symptoms.

As a rule there is no rise in temperature, but the pulse is rapid and the patient looks quite ill and prostrated and develops the symptoms of shock. The abdomen is usually distended and there is distinct tenderness and sometimes rigidity in the region of the abdomen where the obstruction is situated. In strangulated hernia, the hernial sac is swollen and is extremely tender. The contents of the hernia which could be reduced into the abdominal cavity before the obstruction now become irreducible. When peritonitis develops the temperature rises and the characteristic symptoms develop.

The acute functional or toxic intestinal obstruction, which occurs in the course of infectious diseases, or following an operation or the administration of an anesthetic, is characterized by progressive distention of the abdomen with marked constipation, followed by abdominal pain and vomiting.

Chronic Intestinal Obstruction

Cause: Chronic intestinal obstruction is caused by cancer of the intestines, by kinking, or adhesions of the intestine. Cancer is the most common cuase and usually occurs in the large intestine, especially in the rectum, at the hepatic or splenic flexures or in the sigmoid.

Chronic functional intestinal obstruction is a rare form of severe chronic constipation caused by marked weakness of the intestinal muscles.

Pathology: The disease process is a cancerous growth in the intestine or adhesions or bands around the intestine. If the obstruction is of long standing the intestines above the obstruction become markedly thickened and distended.

Symptoms

The symptoms of chronic intestinal obstruction are progressive constipation and abdominal cramps. The cramps are usually localized in the region of the obstruction. The stools gradually become smaller, forming small, round, hard masses. Sometimes the constipation may alternate with diarrhea. If

the obstruction is due to a cancerous growth the stools will frequently contain blood. In such cases the patient also loses in weight and develops the characteristic anemia and cachexia of cancer.

When the physician examines the patient he may observe or feel increased peristaltic contractions of the intestines through the abdominal wall. X-ray examination of the intestinal tract will show the location of the obstruction and sometimes the cancerous growth.

Treatment

The treatment varies according to the cause of the obstruction.

Acute organic intestinal obstruction is treated by an immediate operation. The sooner the patient is operated upon the more favorable is the outcome because portions of the intestine may become gangrenous and peritonitis set in if the operation is deferred. At the operation the surgeon usually relieves the obstruction by removing the cause. If it is caused by a strangulated hernia, the hernial sac is removed and the hernia repaired. If gangrene of the intestine has set in, the gangrenous portion is removed and the stumps of the intestine are united.

Acute functional or toxic obstruction occurring in infections is treated by high colon irrigations, powerful cathartic enemas and cathartics, olive oil, mineral oil, pituitrin, turpentine stupes and similar measures to cause bowel movements.

Chronic organic intestinal obstruction is treated according to its cause. If there is a cancerous growth or other organic cause, this has to be removed by a surgical operation.

Chronic functional intestinal obstruction is treated by powerful drastic purgatives such as compound cathartic pills, calomel, colocynth, gamboge, and by pituitrin injections or powerful cathartic enemas or olive oil, milk and molasses or hydrogen peroxide enemas or colon irrigations. In very severe forms the bowel has to be cleaned out thoroughly by mechanical means.

INTUSSUSCEPTION

Intussusception is an unfolding of one loop of intestine into another. The condition occurs especially in children. It sometimes results from polyps or growths in the intestine. The large intestine or rectum is frequently affected, but the condition may occur in the small intestine as well.

Symptoms: The symptoms are bloody stools and attacks of

intestinal obstruction, pain, vomiting, abdominal distention and rapid pulse, etc.

The treatment is usually surgical.

INTESTINAL TUMORS

Intestinal tumors are growths which form in the walls of the intestines. They may be benign or cancerous. The most common form of tumor in the intestines is carcinoma. It usually occurs in the large intestines, especially in the rectum. The benign tumors are very rare and occasionally form polyps.

The cause of intestinal carcinoma or of the other tumors is unknown.

Symptoms

The symptoms of cancer of the intestinal tract are local and general.

The local symptoms are pain in the abdomen, at the site of the tumor and the symptoms of chronic intestinal obstruction. The patient suffers from progressive constipation and the stools gradually become smaller and consist of small firm masses and frequently contain blood. The constipation may alternate with diarrhea. The physician finds tenderness over the region of the tumor, and is sometimes able to feel the tumor. The X-ray examination shows the obstruction or the tumor in the intestinal tract.

The general symptoms of carcinoma are progressive weakness, loss in weight and anemia. As the disease progresses metastases or cancerous growths develop in the liver and abdomen. As a result jaundice, loss in weight or ascites, fluid in the abdomen, develop.

Treatment

The treatment of intestinal tumors is usually surgical. A portion of the intestine containing the tumor is removed and the stumps are joined together to maintain the intestinal lumen, by an operation called intestinal anastomosis.

CONSTITUTIONAL CONDITIONS

The following diseases are abnormal conditions in the intestines which may be congenital or acquired. The most common constitutional conditions are hernia or protrusion of intestines through weakened spots in the abdominal wall, visceroptosis,

displaced abdominal organs and diverticulæ or pouches in the intestinal wall.

HERNIA

Hernia is a protrusion of the abdominal contents through a weak spot in the abdominal wall.

Cause: The condition is caused by a congenital weakness in some part of the abdominal wall. Sometimes violent exercise may tear muscle fibers or tendons and produce a weak spot in some of the abdominal muscles through which a hernia develops.

Pathology: The most common places where hernia occurs are at the navel or umbilicus and in the inguinal or femoral ring in the groin. Normally these openings are closed by a thin membrane. If this membrane is not sufficiently strong or if the opening does not close completely a hernia develops. The continual pressure of the abdominal organs distends the membrane until it forms a small or large sac, which contains intestines or other organs. In some forms of inguinal or umbilical hernia the sac is as large as a melon. Sometimes the organs in the hernial sac become adherent to the wall.

Clinical Forms: Hernia is usually classified according to the location as follows: inguinal hernia, femoral hernia, umbilical hernia and ventral hernia.

Inguinal hernia is a hernia in the inguinal ring in the groin.

Femoral hernia is a hernia which occurs especially in children through the umbilicus. It is common in infants and children.

Ventral hernia is a hernia through a scar in the abdomen following a surgical operation.

Hernias are also classified according to the condition of their contents, as reducible and irreducible hernias.

A reducible hernia is a hernia in which the contents can be pushed back into the abdomen. An irreducible hernia is a hernia in which the contents are adherent in the sac and cannot be pushed back into the abdomen.

Symptoms: The symptoms of hernia are pain and the presence of the hernial sac which usually contains loops of intestine. If the sac contains intestines, the patient may suffer from constipation.

Complications: Strangulation is a complication which results when the loops of intestine become obstructed and swollen. This causes the symptoms of intestinal obstruction: sudden severe pain in the hernial sac, nausea, vomiting, and marked constipation.

If the hernia was reducible before the attack it now becomes irreducible.

Treatment

Hernia is usually treated by a surgical operation to close the opening and remove the sac. Trusses are sometimes used, especially in children. When the hernia is strangulated, the patient must be operated immediately.

VISCEROPTOSIS

Visceroptosis or splanchnoptosis is a constitutional condition characterized by displaced or low hanging organs in the abdomen. As a rule all the organs in the abdomen are displaced, but various terms are often used to indicate displacement of a particular organ. Gastroptosis is a low hanging stomach. Enteroptosis is displaced intestines. Nephroptosis is a loose or floating kidney.

Cause: The condition is usually a congenital structural characteristic in certain thin nervous persons with poorly developed muscles, generally called asthenics.

Symptoms

In many cases there are no symptoms except the evidence of the low hanging abdominal organs which the physician finds on examination and by means of the X-ray. When symptoms develop they may be divided into visceral, constitutional and nervous symptoms.

The visceral symptoms vary according to the organ principally affected.

Gastroptosis causes various symptoms of indigestion which have already been described, see page 313.

Enteroptosis usually affects the large intestine and sigmoid. It causes retention of feces which often ferment and putrefy. As a result the patient complains of abdominal distention, pulling or dragging sensations in the abdomen, backache and constipation.

Nephroptosis or floating kidney causes pain in the back, and frequent urination. The characteristic symptom is an attack of severe cramplike pain in the right lumbar region and vomiting, called Dietl's crisis.

The constitutional symptoms are a characteristic introspective personality, abnormal fears, and nervous symptoms such as

sleeplessness, rapid pulse, excessive perspiration and various aches and pains all over the body.

Treatment

Visceroptosis is treated by abdominal belts, by diet, rest and sedatives, and by methods which vary according to the organ which is displaced. Some physicians advise the patients to wear abdominal belts to elevate the displaced organ.

The treatment of gastroptosis has already been described, see page 314.

Enteroptosis is treated by diet and remedies to relieve the constipation, and frequent colon irrigations to relieve fermentation and putrefaction in the intestines, and by abdominal massage, exercise and tonics to strengthen the intestinal muscles.

Nephroptosis is treated by abdominal belts to keep the kidney in place and when attacks of colic occur, by rest in bed, atropine and sedatives. Sometimes the kidney is anchored in place by a surgical operation.

The nervous symptoms which are often the chief symptoms are treated by rest, sedatives, hydrotherapy and massage. The patient should be taught to relax and develop confidence in themselves. They should have mental and physical diversions to take their mind away from their symptoms.

DIVERTICULÆ OF THE INTESTINES

Diverticulæ are small pouches which protrude from the wall of the intestines.

Cause: The condition may be congenital or may develop from chronic constipation, especially in stout persons, or after continued use of cathartics.

Symptoms: Diverticulæ may cause no symptoms unless they become inflamed. They may be seen, however, in X-ray pictures of the intestinal tract taken after administration of bismuth or barium mixtures. When diverticulæ become inflamed the patient develops pain in the abdomen, usually on the left side, vomiting, distention, constipation, tenderness, abdominal rigidity and fever. The symptoms are similar to those of appendicitis, but the pain, tenderness and rigidity are on the left side of the abdomen.

Treatment: The treatment depends on the symptoms. When the patient is constipated a diet and mild laxatives, especially mineral oil or agar agar, are advised. High colon irrigations and enemas are usually given.

When diverticulitis develops an ice bag is applied to the abdomen and colon irrigations are given. The severe cases are often operated upon.

DILATATION OF THE COLON

Dilatation of the colon, megalocolon or Hirschsprung's disease is a chronic large dilated colon which is usually congenital and occurs in infancy or childhood.

Cause: The cause of the disease is unknown, but it is believed to be due to spasm of part of the large intestine and dilatation of the intestine above it.

Symptoms: The chief symptoms are marked constipation and progressive distention of the abdomen caused by the markedly distended colon. The child also suffers from abdominal cramps and malnutrition. The large dilated colon can usually be demonstrated by X-ray examination. Sometimes the colon perforates or intestinal obstruction develops. Most cases are fatal.

The condition is treated by a surgical operation to remove the colon.

DISEASES OF THE MESENTERY

The Mesentery: The mesentery is a fanlike, thin, serous membrane which is attached to the intestine and to the back of the abdomen. The arteries and veins of the intestines are situated between its layers. The function of the mesentery is to hold the intestines in place.

MESENTERIC THROMBOSIS

Mesenteric thrombosis is a condition characterized by the formation of a clot in one of the large blood vessels in the mesentery of the small intestine. As a result the circulation in a loop of the intestine becomes blocked and a part of the intestine becomes gangrenous.

Cause: The condition sometimes occurs in arteriosclerosis, in heart disease and in the course of septicemia.

Symptoms

The chief symptoms are a sudden attack of severe abdominal pain and vomiting, and the symptoms of collapse; rapid, weak pulse, slow, shallow breathing, pallor, etc. The bowels are usu-

ally markedly constipated, but sometimes diarrhea with bloody stools develops. Intestinal obstruction usually follows. The pain then becomes more severe, the abdomen becomes distended and the vomiting is fecal in character.

Treatment: The treatment is surgical. The operation is performed immediately and the affected loop of intestine is removed. If operation is delayed the disease is fatal.

DISEASES OF THE RECTUM AND ANUS

STRICTURE OF THE RECTUM

Stricture of the rectum is narrowing or obstruction in the rectum.

Cause: The disease is caused by a scar in the wall of the rectum, which commonly results when a syphilitis ulcer heals.

Symptoms: The symptoms are progressive constipation with characteristic small bandlike stools. In severe cases partial or complete obstruction develops with abdominal pain and inability to move the bowels.

Treatment: The treatment consists of measures to relieve the constipation. Mineral oil, agar agar, licorice powder and cathartics which cause fluid bowel movements are given. Colon irrigations or olive oil enemas are also frequently used. Occasionally the stricture is dilated by means of bougies.

HEMORRHOIDS

Hemorrhoids or piles are small masses of dilated protruding veins which occur around the anus. They may be external or internal. External hemorrhoids occur as small or large tabs around the anus. Internal hemorrohoids are dilatations of the veins in the rectum, which can only be recognized by examination with the finger or by inspection with a proctoscope.

Cause: The most common cause of hemorrhoids is chronic or habitual constipation. The continued pressure of hard fecal masses in the lower part of the bowel and rectum obstructs the return flow in the veins around the rectum so that the terminal veins become dilated and enlarged, forming hemorrhoids. The growth of a tumor in the rectum or the lower part of the bowel may also produce hemorrhoids by pressing on the veins around the rectum. Consequently, the physician always looks for a

growth or other disease in the rectum in every case of hemorrhoids.

Symptoms: The symptoms of hemorrhoids are principally progressive constipation and pain on passing stool, associated with attacks of bleeding from the rectum. When the bleeding is slight the stool is tinged with blood. If the bleeding is extensive, large clots may appear in the stools. The blood is usually bright red in color, indicating that its origin is near the anus.

Complications: The complications of hemorrhoids are strangulation and inflammation.

Strangulation occurs especially in external hemorrhoids, usually as the result of a spastic contraction of the anus, which obstructs the return flow of blood. As a result the hemorrhoids become dilated and swollen. Sometimes strangulated hemorrhoids form quite large, swollen, edematous masses, and occasionally they contain large clots.

When hemorrhoids become inflamed the bowel movements are painful, and the hemorrhoids become red, swollen and tender.

Treatment

Prevention: Hemorrhoids may be prevented by treating habitual or chronic constipation, which is the most common cause.

Treatment: The treatment may be medical or surgical.

Medical treatment consists principally of diet and cathartics to relieve the constipation. The best cathartics are those which lubricate the intestines such as mineral oil, or those which produce fluid stools, such as compound licorice powder. Various suppositories containing glycerine or other substances are used to reduce the size of the hemorrhoids and to relieve the pain on passing stool which is often a distressing symptom.

Strangulated or inflamed hemorrhoids are treated by rest in bed and frequent olive oil or other enemas, by wet dressings of cold antiseptic solutions such as Burow's solution or other substances.

Surgical treatment consists of removing the hemorrhoids by various surgical procedures. When the hemorrhoids are due to a tumor or some other disease of the rectum more extensive surgical operations are usually performed.

FISSURES

Fissures are small longitudinal ulcers which occur in the mucous membrane of the rectum. They are usually associ-

ated with hemorrhoids, but they may be present without them.

Symptoms: The symptoms are usually pain on passing stool. Sometimes spastic contraction of the anus occurs during bowel movements.

The disease is treated by a bland nonirritating diet, by mineral oil or similar laxatives. In severe cases an anesthetic is administered and the sphincter is stretched.

FISTULA

Fistula in the rectum or anus is a small opening or sinus in the region of the rectum or anus. The opening may be internal, external or both.

An internal fistula opens into the rectum. An external fistula opens through the skin around the anus. Some fistulas have an external as well as an internal opening. The fistula may be a straight, narrow passage or the direction may be an irregular sinus with several branches.

Cause: Fistula usually results when an infection or abscess around the rectum heals. The opening through which the pus discharges often remains, thus forming a fistula. Tuberculous fistula of the anus or rectum is a form of fistula which sometimes occurs in long-standing cases of chronic pulmonary tuberculosis.

Symptoms: The symptoms are pain on passing stool or on sitting down and a discharge of pus from the rectum. The bowel movements are usually accompanied by severe spasm or tenesmus.

Treatment: The treatment is usually surgical. The operation consists of cutting through the sphincter of the anus to the fistula and allowing the wound to heal by the formation of a scar.

CHAPTER XXV

DISEASES OF THE LIVER, GALL BLADDER AND PANCREAS

Physiology of the Liver

The liver is a large pyramidal-shaped organ with smooth convex surfaces situated in the upper part of the abdomen, extending clear across from the right side to the left. The largest part of the organ is situated in the right upper quadrant of the abdomen. The liver is the largest gland in the body and consists of groups of cells arranged in small lobules, with a duct in the center through which the cells pour a secretion. The smaller ducts gradually unite, forming ducts of larger size and finally the common bile ducts of the liver.

A good deal about the function of the liver is not definitely known. We do know, however, a number of important functions of the liver which may be divided into three groups:

1. The external secretory function.
2. The internal secretory function.
3. The detoxicating function.

External Secretion: The external secretory function of the liver consists of forming and secreting bile.

The Bile: The bile is a thick brown fluid which is secreted by the liver cells and flows through the hepatic and common bile duct into the intestine during the process of digestion. At other times it is stored in the gall bladder.

The bile contains a number of salts which aid in the digestion and absorption of fats. It also acts somewhat as a laxative. It checks intestinal fermentation or bacterial action by its antiseptic property. It also contains dissolved cholesterol, a complex fatty substance.

Internal Secretory Function: The internal secretory function of the liver consists of storing sugar in the form of glycogen, a special kind of animal sugar. This is formed by the digestion of carbohydrates and sugars in the food. The glycogen is secreted into the blood stream from the liver and is utilized by

the muscles for muscular contractions and by other organs and issues. The liver also removes the iron from hemoglobin and changes it into the various bile pigments which give the color to the bile. It also assists blood clotting by forming a necessary ferment, antithrombin.

It has recently been shown that the liver probably secretes an internal secretion into the blood stream which tends to neutralize poisons which cause high blood pressure.

Detoxicating Function: The detoxicating function of the liver consists of neutralizing certain toxic substances which result from the metabolism of proteins. For example, it changes ammonia, which is formed in the course of protein decomposition, to urea, a waste product which is excreted through the kidney.

Physiology of the Gall Bladder and Bile Ducts: The gall bladder is a globular or pear-shaped organ situated in the under surface of the liver at its border. It consists of a mucous membrane and a muscular coat surrounded by fibrous tissue. There is a sphincter at the opening of the gall bladder which prevents the flow of bile except when it is required in the process of digestion.

The bile ducts begin as small ducts within the liver lobules which gradually unite to form larger ducts, finally forming the main hepatic duct. This is joined by the duct from the gall bladder, which is known as the cystic duct. The hepatic duct is then continued as the common bile duct, which enters the second portion of the duodenum at the same point with the pancreatic duct.

The function of the gall bladder is to store the bile secreted by the liver and to pour it into the intestine during the process of digestion. The flow of bile is caused by the contractions of the gall bladder and bile ducts which are started when the sphincter is relaxed by the acid contents which enter the duodenum from the stomach.

Symptoms of Diseases of the Liver and Biliary System

The symptoms of diseases of the liver, gall bladder and bile ducts may be divided into subjective and objective symptoms.

Subjective Symptoms

The subjective symptoms may be a characteristic pain, and the general symptoms of indigestion already described with dis-

eases of the stomach: fullness in the upper part of the abdomen, distention, belching and nausea or vomiting. Biliousness is a feeling of discomfort or fullness in the stomach, nausea or vomiting associated with headache and dizziness. It may be caused by disease of the liver or gall bladder as well as by constipation, disease of the stomach or by a number of other causes.

Pain: The pain is often characteristic in diseases of the gall bladder or bile ducts. It is usually a colic or cramp situated in the right upper quadrant of the abdomen and frequently radiates to the back, stomach or right shoulder. It usually develops suddenly and is often so severe, especially when caused by gall stones, that it can only be relieved by a hypodermic injection of morphine.

The pain in diseases of the liver is not cramplike but a dull or sharp pain in the right upper quadrant of the abdomen.

Objective Symptoms

The objective symptoms may be divided into several groups as follows:

1. Jaundice.
2. Signs obtained by the physician.
3. Ascites.
4. X-ray signs.
5. Laboratory tests indicating disturbed function.

Jaundice

Jaundice or icterus is a yellow color of the skin and mucous membranes caused by the presence of bile in the tissues. It is the most important symptom of disease of the liver, gall bladder or bile ducts. When the jaundice is slight, the yellow color is only apparent on the sclera of the eyeball where a very thin mucous membrane covers the white sclera.

Cause: Jaundice is usually caused by an obstruction in the common bile duct or in the bile ducts in the liver. The obstruction is commonly caused by a gall stone in one of the bile ducts. It may also be due to inflammation of the ducts or to pressure on the ducts by a cancer, tumor or adhesions. Sometimes the obstruction occurs within the liver, in the very fine bile capillaries. This is the cause of jaundice in syphilis of the liver, in arsenic or phosphorus poisoning and in various infections. As a result of the obstruction the bile cannot flow into the intestines

and is dammed back into the blood stream. It is then carried by the circulating blood to the tissues, giving them a yellow color. The obstruction may be partial or complete. In complete obstruction no bile can enter the intestines through the ducts and the stools become white or clay colored because the brown color of a normal stool is due to the bile which it contains. When the obstruction is only partial, some bile flows into the intestines, but not in sufficient quantities, and the brown color of the stools is lighter than normal.

Hemolytic Jaundice of Hemotogenous Jaundice is a form of jaundice due to the formation of bile pigment in the skin from the hemoglobin of the blood. An example of this form of jaundice is the discolorization of the skin which often follows an ecchymosis or "black and blue" spot.

Symptoms: Jaundice is always accompanied by the following characteristic symptoms:

1. The urine is very dark brown in color, because it contains bile.
2. The stools may be white or "clay colored" if there is a complete obstruction in the bile ducts, or gray or light brown when there is a partial obstruction.
3. Itching of the skin.
4. The coagulation time of the blood is diminished. Consequently patients with jaundice bleed more easily and longer than normal persons.
5. Fatigue and drowsiness.
6. Cholemia is a condition which develops in severe and long standing cases. It is characterized by delirium, stupor and coma and is often fatal.

Objective Symptoms Obtained by the Physician

When the physician examines the patient he usually finds definite areas of tenderness in the right upper quadrant of the abdomen, or rigidity of the muscles. In some cases he is able to feel the gall bladder and it may be large or tender. The liver border is often felt and is irregular, nodular or tender.

Ascites: Ascites is an accumulation of fluid in the abdomen. It is a frequent symptom in certain diseases of the liver, especially cirrhosis. It is caused by any disease of the liver which presses on branches of the portal veins. As a result the return flow of blood through the portal veins is retarded or obstructed and serum accumulates in the abdomen.

X-ray Examination: The presence of gall stones or disease of the gall bladder is often demonstrated by X-ray pictures of the gall bladder and bile ducts.

The Graham test or Cholecystography is a method of determining a diseased gall bladder by X-ray pictures taken after administering a complex dye, tetraiodophthalein. The gall bladder becomes filled with the dye and shows as a definite shadow in the X-ray pictures.

The technique of the test is as follows:

1. The patient is given a cathartic two nights before the pictures are to be taken.
2. The night before the X-ray examination the supper consists of thick soup, cream of chicken or two boiled eggs, and baked potatoes or milk toast with butter.
3. After supper, beginning at 8 P.M., the patient takes two capsules, each containing gr. v of tetraiodophthalein and one capsule containing gr. v of sodium bicarbonate, every fifteen minutes for two hours, in water. No food or drink is allowed after taking the last capsule.
4. At 8 A.M. the following morning an X-ray picture of the gall bladder is taken.
5. At 11:30 A.M. another X-ray picture is taken.
6. At 12 o'clock the patient eats lunch consisting of two boiled eggs, toast and a glass of milk. An hour later another picture is taken.
7. Thirty-six hours after beginning the test an X-ray picture of the gall bladder is taken again.

A normal gall bladder usually shows as a definite shadow on the X-ray pictures. If the gall bladder is diseased or if its duct is obstructed by a stone, the gall bladder shadow does not appear.

Laboratory Tests

The following tests are used to determine the function of the liver or disease of the gall bladder.

The Lyons Test: The Lyons Test is a test to determine disease of the gall bladder, by studying the character of the bile obtained through a duodenal tube.

The technique of the test is as follows:

The patient swallows a duodenal tube until it reaches the duodenum. When the tube is in the duodenum, the test is performed usually in the morning when the stomach is empty, with

the patient lying on the right side. It consists of obtaining seven specimens of bile in separate bottles.

1. The first specimen is obtained by aspirating 30 to 50 c.c. of bile through the tube. This is poured into a bottle and labeled "fasting specimen."
2. 60 c.c. of a warm 25% solution of magnesium sulphate is then slowly injected with a syringe into the duodenal tube.
3. After fifteen or twenty minutes the duodenal fluid is allowed to flow or is aspirated into the same bottle. As soon as the color of the bile changes another bottle is used.
4. The bile is allowed to flow or is aspirated continually, but into a new bottle whenever the color changes, until seven specimens are obtained or until no more fluid can be obtained.

Each bottle should be corked and properly labeled—indicating the number of the specimen, the change in color, the time when it occurred and the date.

Sometimes 60 c.c of olive oil, glucose solution, peptone or bouillon is injected into the tube instead of magnesium sulphate.

The Icteric Index: This is a test to determine the presence of minute quantities of bile or bile pigments in the blood. The physician is thereby able to recognize slight jaundice which is not apparent by ordinary examination.

The Van den Bergh Test: This is a complicated blood test to determine whether jaundice is due to obstruction or to other causes. The blood is examined for bile pigments and bilirubin.

Phenoltetrachlorphthalein Test: This is a test which determines liver function by studying the ability of the liver to eliminate a complex dye, phenoltetrachlorphthalein. It consists of obtaining a specimen of the blood from an arm vein and then injecting 5 mg. of the dye for each kilo of weight into the vein. Another specimen of blood is obtained fifteen minutes, one hour and two hours after the injection. If the liver function is affected, part of the dye still remains in the blood in the last specimen.

Symptoms to be Observed by the Nurse

When nursing diseases of the liver and gall bladder the nurse should observe and record the following symptoms:

1. Pain: the location, radiation and character.

2. Vomiting: the frequency and character of the vomited material.
3. Jaundice: the extent and the depth of the color and the associated symptoms.
4. The character of the stools, their color and whether they contain stones.
5. The color and quantity of the urine.

DISEASES OF THE BILE DUCTS AND GALL BLADDER

The most common diseases of the bile ducts and gall bladder are catarrhal jaundice, cholecystitis and gall stones.

CATARRHAL JAUNDICE

Catarrhal Jaundice is a disease of the bile ducts characterized by sudden development of jaundice.

Cause: The disease occurs particularly in young people and usually follows overeating or drinking alcoholic liquors to excess, infections, or irritation of the stomach and duodenum.

Pathology: It is generally believed that catarrhal jaundice is produced by obstruction in the biliary system, but there are two opinions as to where the obstruction occurs. Most physicians believe the disease process is an inflammation of the common bile duct. As a result of excessive secretion of mucus this duct becomes blocked by a plug of mucus and jaundice results. On the other hand some physicians believe the disease is due to an acute hepatitis, an acute inflammation of the liver. The liver cells become swollen and block the fine bile capillaries, thus producing jaundice.

Symptoms

The symptoms are usually indefinite symptoms of indigestion, fullness, distention, loss of appetite and sometimes nausea and vomiting, constipation and diarrhea, and slight temperature, 100° to 101° F. This is followed by jaundice, which is usually slight, but gradually becomes deeper. At first the obstruction of the bile ducts is partial, but later it becomes complete and the stools become clay colored. The patient also has all the usual symptoms of jaundice, such as itching of the skin, slow pulse, slight drowsiness, etc.

Treatment

The disease is treated by a suitable diet and remedies to increase the flow of bile, which are given by mouth or through a duodenal tube.

The diet usually consists of milk, cereals, cooked vegetables and fruits. All fatty foods such as cream, bacon, eggs, etc., are eliminated because they are not readily digested when the secretion of bile is diminished. Alkaline waters are also usually ordered.

The remedies usually given to increase the flow of bile and to relieve the inflammation of the duodenum are calomel, saline purgatives such as sodium phosphate, sodium sulphate, Epsom salts, citrate of magnesia and intestinal antiseptics such as salol or bismuth salicylate. Frequently various alkalies such as bismuth or magnesia are ordered to allay the irritation of the stomach and intestines. High colon irrigations with bicarbonate of soda are frequently given.

Lyons Treatment: This is a method of establishing the flow of bile by irrigating the duodenum through a duodenal tube. The patient swallows a duodenal tube until it reaches the duodenum. A 25% solution of magnesium sulphate is then injected through the duodenal tube daily to stimulate the flow of bile.

ACUTE CHOLECYSTITIS

Acute Cholecystitis is an acute inflammation of the gall bladder.

Cause: The most common cause is an infection by typhoid bacilli, which frequently lodge in the gall bladder in the course of typhoid fever. It may also be caused by repeated attacks of chronic appendicitis, chronic gastritis, chronic constipation, or other infections in the region of the gastrointestinal tract. Gall stones are usually a predisposing factor.

Pathology: The disease process is a severe acute infection of the gall bladder and bile ducts. The gall bladder is severely inflamed and swollen and becomes filled with mucus. In severe cases the gall bladder contains pus and sometimes becomes gangrenous.

Symptoms

In mild cases the patient complains of pain in the right upper quadrant of the abdomen, fullness and distress after eating.

The characteristic symptom is a sudden severe sharp cramplike pain in the right upper quadrant of the abdomen, occurring in the course of an acute infectious disease like typhoid fever, or suddenly while the patient is apparently in good health. The pain usually radiates to the back and up to the shoulder. It is sharp, severe and cramplike and is accompanied by persistent nausea and vomiting. At first the vomited material contains food, but later only mucus and bile. There is usually a rise in temperature, which may be slight, 100° or 101° F. When the gall bladder contains pus the temperature may be much higher, the pulse is rapid, the abdomen is distended and the patient has symptoms of shock.

When the patient is examined the physician finds the right upper quadrant of the abdomen very tender and often very rigid. If the gall bladder contains pus the tenderness and rigidity of the muscles may be very marked. The blood examination usually shows an increase in the number of leucocytes and polynuclear cells.

When the attack subsides a Lyons Test is sometimes done to examine the bile from the gall bladder. It is usually turbid and contains leucocytes and pus. Sometimes the gall bladder is obstructed and no bile is obtained from the gall bladder, but only from the liver.

Complications

The complications of an acute cholecystitis are gangrene of the gall bladder or perforation.

Gangrene: Gangrene of the gall bladder may result from a severe infection. It is characterized by a marked rise in temperature with a rapid pulse, extreme tenderness and rigidity of the abdomen and the symptoms of peritonitis; abdominal distention, shock, shallow respiration, etc.

Perforation: Perforation of the gall bladder may occur suddenly or gradually. A sudden perforation produces symptoms of an acute spreading peritonitis: a sudden rise in temperature, nausea and vomiting, abdominal distention, marked pain, tenderness and abdominal rigidity. When the perforation occurs slowly the same symptoms develop, but more slowly.

Treatment

The treatment of acute cholecystitis may be medical or surgical.

Medical Treatment: Medical treatment consists of treating

the attack of colic, a suitable diet, administration of various remedies and gall bladder drainage.

Treatment of the Attack: The severe cramplike pain is often relieved by applying a hot water bag, an electric pad or turpentine stupes to the upper right quadrant of the abdomen, or by frequent hot drinks. If these methods are not sufficient a hypodermic injection of morphine or of atropin or a combination of both will relieve the attack.

Diet: During the attack only warm liquids are ordered. When the attack has subsided the diet usually consists of warm milk, soup, cereals, some cooked vegetables and custard. Foods rich in fat such as bacon, cream, gravies or similar substances are not allowed.

Remedies: Saline purgatives such as sodium sulphate, sodium phosphate, Carlsbad Salts, etc., are given to relieve the inflammation in the bile ducts and gall bladder and to stimulate the flow of bile. To relax the spasm of the gall bladder atropin is given either hypodermically or by mouth.

Gall Bladder Drainage: The Lyons treatment is often used when the acute stage is over. It consists of irrigating the duodenum daily through a duodenal tube with a 25% solution of magnesium sulphate to drain the gall bladder of its infectious material.

Surgical Treatment: The cases in which the gall bladder contains pus are usually operated. Gangrene of the gall bladder or perforation require an immediate operation.

CHRONIC CHOLECYSTITIS

Chronic Cholecystitis is a chronic inflammation of the gall bladder.

Cause: The disease is caused by repeated attacks of appendicitis, chronic constipation and chronic infections of the intestinal tract. It is usually associated with gall stones.

Pathology: The gall bladder is usually thickened and firm and contains a good deal of mucus, thick bile, pus and sometimes stones. Sometimes the duct of the gall bladder becomes obstructed.

Symptoms

The symptoms are similar to those caused by gall stones and may be divided into two groups: (1) gall bladder colic, (2) symptoms of indigestion.

Gall Bladder Colic: The gall bladder colic comes in attacks and is usually characterized by sudden sharp, cramplike pains in the right upper quadrant of the abdomen, radiating to the back and to the right shoulder, associated with nausea and vomiting. Sometimes there is a chill and a slight rise in temperature. Between the attacks the patient is normal or suffers from indigestion.

When the patient is examined during the attack the gall bladder region of the abdomen is tender or the gall bladder is enlarged.

Symptoms of Indigestion: In some cases the only symptoms are chronic indigestion; a sense of fullness in the stomach, distention and belching of gas, and occasionally attacks of nausea and vomiting. Chronic cholecystitis is one of the most common causes of indefinite symptoms in the upper part of the abdomen.

Objective Signs: The Lyons Test usually shows cloudy, thickened bile with evidence of an infected gall bladder.

The examination of the gall bladder and biliary system by the X-ray may demonstrate a small thickened gall bladder. The Graham test may show absence of a gall bladder shadow.

Treatment

The treatment of chronic cholecystitis may be either medical or surgical.

Medical Treatment: Medical treatment consists of measures to relieve the attacks of colic, a suitable diet and remedies to increase the flow of bile.

The attacks of colic are treated by a hot-water bag, an electric pad or other local applications, and warm drinks. When these measures are not effective morphine or atropine or both are given.

The diet consists of warm liquids at first, followed by small quantities of simple foods such as cereals, diluted milk, cooked vegetables, meats, eggs. Coarse vegetables and fats are eliminated.

The flow of bile is stimulated by saline purgatives, magnesium sulphate, calomel, Carlsbad salts and various other substances.

The Lyons method of irrigating the duodenum with a 25% solution of magnesium sulphate is frequently used to increase the flow of bile and to remove infectious material from the gall bladder.

Surgical Treatment: When the cholecystitis is associated with gall stones or when medical treatment is not effective the gall bladder is usually removed by a surgical operation.

CHOLELITHIASIS OR GALL STONES

Cholelithiasis or gall stones are stones which form in the gall bladder and sometimes in the bile ducts as well.

Cause: Gall stones are usually caused by a chronic infection of the gall bladder and by a change in the character of the bile. It is more prevalent in women than in men and especially when they are stout and above the age of 40. Chronic infections of the gall bladder, followed by the formation of gall stones, frequently result from typhoid fever, repeated attacks of appendicitis, chronic constipation and other chronic infections of the intestinal tract.

Gall stones frequently develop after repeated pregnancies and in obesity because in both of these conditions the bile contains excessive quantities of cholesterol, a special form of fat which forms gall stones. They sometimes develop after rapid reduction cures, because some of the fat is eliminated in the bile as cholesterol, which often forms stones.

Pathology: The formation of stones begins with a chronic infection of the gall bladder. As a result the gall bladder contains bacteria, pus or mucus and its wall becomes thickened. The bile salts or cholesterol then crystallize around the particles of mucus or pus, forming stones.

At first the stones are fine gravel, but they become larger as crystallization increases. There may be a single large stone or numerous smaller ones. As a rule the stones consist principally of cholesterol, a phosphorized fat; but other stones, especially calcium phosphate stones, may occur.

Symptoms

Gall stones may occur in the gall bladder without causing any symptoms. The usual symptoms of gall stones may be divided into three groups:

1. Gall stone colic.
2. Attacks of Cholecystitis.
3. Atypical symptoms.

Gall Stone Colic: Gall stone colic is produced when a stone passes from the gall bladder into the bile ducts. The attack begins suddenly with a sharp, severe, cramplike pain in the right upper quadrant of the abdomen, followed by nausea and vomiting. The pain is characteristic and usually radiates to the back, up to the right shoulder and sometimes to the stomach or to the

middle of the abdomen. It may last a few minutes or several hours, or even for days if the stone blocks one of the bile ducts. Frequently, however, a dull pain remains after the attack and there is a rise in temperature and pulse rate.

The subsequent symptoms depend on the location of the stone. Jaundice may develop after the attack if the stone lodges in the common bile duct or in the hepatic duct, the duct from the liver. When the duct is completely blocked no bile flows into the intestine, the stools become clay colored and the urine becomes very dark because it contains bile. When the stone does not occlude the duct completely, bile still flows into the intestine and the stools are not clay colored but of a lighter brown color. The jaundice may subside in a few days if the stone falls back into the gall bladder. If the stone remains fixed in the common bile duct, then the jaundice persists until the obstruction is relieved. If the stone lodges in the cystic duct no jaundice occurs, but the gall bladder becomes distended unless its wall is too thick.

The attacks of gall stone colic usually recur, but the frequency of the attacks depends on the number of stones in the gall bladder, and their size.

Symptoms of Acute Cholecystitis: Gall stones are usually associated with infection in the gall bladder and bile ducts. Consequently an attack of gall stone colic is often followed by fever and a rapid pulse because the obstruction of the bile ducts causes retention of pus or infected bile in the gall bladder. Some patients may have mild temperature for days or weeks even without colic as a result of absorption of pus from the infected gall bladder.

Atypical Symptoms: In many cases the only symptoms of gall stones are indefinite chronic indigestion or various pains. The patient complains of sudden attacks of distention, nausea or vomiting or pain in the pit of the stomach. These symptoms are often periodic and may be produced by overeating or by coarse indigestible food. Sometimes a sense of pressure or pain over the heart occurs which may be similar to an attack of angina pectoris.

Objective Signs: When the physician examines the patient he finds the gall bladder very tender and sometimes enlarged.

X-ray examination will often demonstrate the stones in the gall bladder. The Graham test may show a stone blocking the duct or a diseased gall bladder.

Laboratory Tests: The physician usually performs various

tests in cases of gall stones, especially the Lyons test, the Icteric index, and the Van den Bergh test.

The Lyons test may indicate that the gall bladder duct is obstructed when no bile is obtained from the gall bladder, or that the gall bladder is infected by the character of the bile.

The icteric index is used to recognize mild jaundice which is too slight to be apparent.

The Van den Bergh test is used to determine that the jaundice is due to an obstruction in the bile ducts.

Complications: The most common complications are chronic cholecystitis, pancreatitis, adhesions and stricture of the bile ducts.

Chronic cholecystitis is usually associated with gall stones and is responsible for many of the symptoms such as fever and turbid bile.

Chronic pancreatitis is another frequent complication which often produces pain in the pit of the stomach.

Stricture of the bile ducts results from scar formation within the bile ducts. It produces obstruction and causes jaundice.

Adhesions to the stomach and duodenum are a frequent sequel of long continued gall-bladder disease. It often causes pyloric stenosis.

Perforation is a serious complication. The gall bladder may perforate into the abdomen or the duodenum. It causes the symptoms of acute peritonitis.

Treatment

Prevention: There is no specific treatment for preventing the formation of gall stones. However, various measures may be employed during convalescence from typhoid fever, and in intestinal infections to prevent gall-bladder infections. They consist principally of cathartics and frequent colon irrigations.

In pregnancy and obesity various cathartics are given to increase the flow and prevent retention of bile in the gall bladder. Persons who are predisposed to gall stones should avoid overeating and should take fats sparingly. They should move their bowels regularly and take saline purgatives at frequent intervals. They should avoid obesity by eliminating fats from the diet.

Treatment of Gall Stone Colic: A patient who has an attack of gall stone colic should be kept in bed. A hot-water bag, an electric pad or hot poultices or turpentine stupes are usually applied to the right upper quadrant of the abdomen. No food

is allowed except warm drinks or warm water with bicarbonate of soda. When the attack subsides, cereals, skimmed milk or diluted milk and cooked vegetables are given. Colon irrigations are sometimes ordered. When the attacks are severe morphine or atropine or both are given hypodermically.

Diet: The diet should contain very little fat or roughage. It should consist of diluted or skimmed milk, cereals, thick soups, cooked fruits and vegetables. The foods should be given warm and in small quantities at frequent intervals. The following foods are to be avoided: eggs, bacon, cream, fish, fat meats, cheese, salads and dressings, all condiments and alcoholic drinks. Even after the gall-bladder and stones are removed fatty foods should be avoided to prevent a recurrence.

Symptomatic Treatment: There are no remedies which can dissolve gall stones. The object of medicinal treatment for gall stones is to increase the flow of bile, to relax spasm of the bile ducts and to disinfect the bile.

Sodium sulphate, sodium phosphate, sodium bicarbonate, Epsom salts, calomel and olive oil are given to increase the flow of bile. Mineral waters such as Carlsbad water, Contrexeville water and similar waters are also frequently used.

Atropine or belladonna preparations are given to relax the spasm of the bile ducts.

To disinfect the bile, sodium benzoate, sodium salicylate, salol or aspirin are given. It is also essential to prevent intestinal putrefaction by moving the bowels frequently by means of cathartics such as phenolpthalein, mineral oil, calomel, colocynth, podphyllin, cascara or other substances.

Surgical Treatment: Surgical treatment consists of removing the gall bladder by a cholecystectomy operation. If this is not feasible, the gall bladder is opened and drained and the stones removed.

Nursing Care: When nursing a case of gall stones it is important for the nurse to observe the color and consistency of the stools and search for stones in every stool, especially after an attack of colic. She should also note the character of the vomited material and the color of the urine. The diet is especially important. All foods ordered should be given warm and in small quantities.

During an attack she should make the patient as comfortable as possible and administer warm drinks and apply the hot local applications usually ordered.

When the patient is operated upon the usual post-operative

care is given. If the gall bladder is drained by a tube the nurse should report any change in the flow of bile or in its character.

CANCER OF THE GALL BLADDER AND BILE DUCTS

Cancer sometimes develops in the gall bladder or bile ducts.

Cause: The specific cause is unknown, but it is more prevalent among patients with gall stones and in women.

Symptoms: The symptoms are similar to chronic cholecystitis or gall stones. The patient complains of constant dull pain in the right upper quadrant of the abdomen and jaundice which develops gradually and persists. These local symptoms are associated with gradual loss in weight and strength and the characteristic cachexia and anemia.

The treatment is surgical and consists of removing the gall bladder.

DISEASES OF THE LIVER

CONGESTION OF THE LIVER

Congestion of the liver, or passive congestion of the liver, is an engorgement of the liver with blood. It is usually associated with a similar engorgement or passive congestion in the stomach and intestines.

Cause: The condition usually develops in heart disease when the patient suffers from decompensation. The inability of the heart to maintain an adequate circulation causes a backflow of blood into the auricles, the inferior vena cava and then into the liver.

Symptoms: The symptoms are pain and a feeling of distress in the upper part of the abdomen, associated with symptoms of indigestion, nausea, sometimes vomiting and slight jaundice. They are associated with the symptoms of decompensation of the heart, dyspnea, shortness of breath and cyanosis.

The physician can feel a large tender liver, which often pulsates. The condition is treated by digitalis and saline purgatives, or calomel.

CIRRHOSIS OF THE LIVER

Cirrhosis of the liver is a chronic inflammatory disease of the

liver characterized by scar formation within the liver. It is commonly called hardening of the liver. The disease occurs in several forms as follows:

1. Atrophic Cirrhosis.
2. Fatty Cirrhosis.
3. Hypertrophic Cirrhosis.
4. Syphilitic Cirrhosis.

Atrophic cirrhosis is a form of cirrhosis in which the liver is small and hard.

Fatty cirrhosis is a form of cirrhosis in which the liver consists partly of fat.

Hypertrophic cirrhosis is characterized by a large liver.

Syphilitic cirrhosis is a form of cirrhosis caused by syphilis.

Cause: The cause of cirrhosis of the liver is usually chronic alcoholism, particularly inveterate whisky drinking. Fatty cirrhosis may be caused by excessive beer drinking. Syphilis frequently causes a large nodular form of cirrhosis of the liver.

Pathology: The habitual use of alcohol destroys many of the active cells in the lobules of the liver which are then replaced by scar tissue. As the scar tissue contracts the liver becomes smaller, firm and hard. The formation of scar tissue within the liver lobules also compresses branches of the portal veins. As a result the stomach and intestines and other neighboring organs become congested and chronic gastritis or chronic enteritis often result. Fatty cirrhosis is characterized by formation of fat within the liver in addition to the scar tissue. Syphilitic cirrhosis forms a large irregular-shaped nodular liver.

Symptoms

The symptoms of cirrhosis of the liver may be divided into two groups:

1. Symptoms of Portal Vein Obstruction.
2. Symptoms of Disturbed Liver Function.

Symptoms of Portal Vein Obstruction: The symptoms of cirrhosis of the liver are caused principally by obstruction of the branches of the portal vein within the liver. At first this causes persistent congestion in the stomach and intestines and later as the veins in the abdomen become dilated and engorged, fluid accumulates in the abdomen, a condition called ascites.

The symptoms of congestion in the stomach are indigestion, loss of appetite, fullness, distention, occasionally nausea and vom-

iting of bile-stained mucus. The stomach contents usually contain no hydrochloric acid or pepsin, but a good deal of mucus and sometimes traces of blood. As the disease progresses the veins in the stomach become dilated and sometimes rupture. When this occurs the patient may vomit blood.

The symptoms of congestion in the intestines are constipation and sometimes diarrhea and frequently hemorrhoids.

Ascites or accumulation of fluid in the abdomen is the characteristic symptom of cirrhosis of the liver. At first the quantity of fluid is small, but as the disease progresses the abdomen becomes filled with fluid and markedly distended. This often causes shortness of breath, difficult breathing and sometimes cardiac decompensation.

When the physician examines the patient he notes the dilated veins over the abdomen and finds evidence of fluid in the abdomen. When the fluid is withdrawn he finds the liver enlarged in fatty cirrhosis and a large nodular liver in syphilitic cirrhosis. The spleen is sometimes also enlarged.

Symptoms of Disturbed Liver Function: The symptoms of disturbed function of the liver are slight jaundice, headache, fatigue and in severe cases, delirium and coma. The jaundice is sometimes only recognized by an increase in the icteric index and is frequently absent. In hypertrophic cirrhosis the jaundice is often marked. Other liver tests will show a disturbance in the function of the liver.

Complications: The most common complications of cirrhosis of the liver are esophageal varices and tuberculosis. Esophageal varices are dilated veins at the cardiac end of the stomach. They sometimes rupture, causing a severe hemorrhage from the stomach, which may be fatal. Pulmonary tuberculosis sometimes develops in patients with cirrhosis.

Treatment

The treatment may be divided into: (1) Prevention, (2) Dietary treatment, (3) Symptomatic treatment, (4) Treatment of complications.

Prevention: The two most common forms of cirrhosis may be prevented; alcoholic cirrhosis by temperate habits and avoiding alcohol and syphilis of the liver by early and intensive treatment of syphilis.

Diet: The diet consists of simple foods prepared without spices and served without condiments. The foods given vary accord-

ing to the severity of the gastric symptoms. As a rule cereals, milk and cooked vegetables are the principal foods given. Fatty foods, meats and coarse vegetables, salads and alcoholic beverages are eliminated.

Symptomatic Treatment: The symptoms which are usually treated are the symptoms of chronic gastritis, the intestinal symptoms and the ascites. For the chronic gastritis a suitable diet already described is ordered and pepsin and hydrochloric acid to supply the deficient gastric juice. Sometimes sodium bicarbonate is given before meals. For the constipation various cathartics, especially saline purgatives, are given.

The ascites is treated by limiting the fluids, by various remedies, and if these are not effective, the fluid is removed. The fluid intake is usually limited to 500 c.c. in twenty-four hours. The remedies used as saline purgatives, such as Epsom salt and citrate of magnesia or sodium phophate in large doses to produce fluid bowel movements, thereby removing fluid from the abdomen. Various diuretics are often ordered such as digitalis, theobromine, diuretin, theocin, or Guy's or Fothergill's Pills, which consists of calomel, squills and digitalis. Intravenous injections of novasurol, glucose, or calcium chloride are sometimes given to increase the flow of urine. When the abdomen becomes full of fluid and shortness of breath develops the fluid is withdrawn from the abdomen.

Paracentesis: This is a procedure for removing the fluid from the abdomen. The patient sits in an upright position and the bladder is catheterized. The skin over the lower part of the abdomen is sterilized by alcohol or by tincture of iodine. A trocar and cannula is then inserted into the lower part of the abdomen midway between the navel and pubes. The trocar is then removed and the fluid is allowed to flow into a pail. In this way large quantities of fluid, as much as several gallons, are removed.

Some patients develop shock during tapping. The pulse becomes rapid and weak and the patient may faint. Consequently the nurse should always have stimulants ready for such an emergency.

Surgical Treatment: Surgical treatment is used when the ascites recurs rapidly after each tapping. An operation called omentopexy is performed. It consists of sewing the omentum to the abdominal wall to establish a new circulation and overcome the obstruction in the portal vein.

ABSCESS OF THE LIVER

Abscess of the liver is an infection of the liver characterized by the formation of an abscess.

Cause: The most common cause of liver abscess is extension of the infection to the liver, in ulcerative colitis, especially amebic colitis. It may also result when the infection extends into the liver from the bile ducts in gall stone cases, or in acute appendicitis. It is also a common complication of bacteriemia.

Pathology: The disease process consists of the formation of an abscess within the liver. There may be a single large abscess or several smaller ones. Amebic abscess is usually a large single abscess. In bacteriemia, however, numerous smaller abscesses may form throughout the liver.

Symptoms

The symptoms usually develop in the course of an amebic colitis or bacteriemia either suddenly or gradually. They are chiefly a septic fever and local signs indicating an abscess in the liver. The temperature is usually intermittent, but it may be remittent and is accompanied by frequent chills and profuse sweats. As the disease progresses the patient becomes weak, emaciated and pale. The symptoms indicating the abscess are pain in the right upper quadrant of the abdomen, nausea and vomiting and sometimes jaundice.

When the patient is examined the liver is found to be very tender and frequently enlarged, and the upper part of the abdomen is very rigid. When the liver abscess results from amebic colitis the local signs are marked, while the abscess which develops in bacteriemia is characterized chiefly by a septic fever, chills and sweats and very few signs in the region of the abscess.

Complications: The most common complication of liver abscess is extension or perforation into neighboring organs or the abdominal cavity. The abscess may perforate into the chest, causing empyema or into the lung and form a lung abscess. Occasionally the abscess perforates into the peritoneum, causing peritonitis.

Subphrenic Abscess: Subphrenic abscess is an abscess which forms between the upper surface of the liver and the under surface of the diaphragm. It usually results from extension of the infection from acute appendicitis, lung abscess or other infections in the abdomen.

The symptoms are similar to liver abscess: septic fever, chills, sweats and marked pain and tenderness in the right upper quadrant of the abdomen and right lumbar region.

Treatment

The treatment is surgical and consists of opening and draining the abscess. The amebic abscess is usually irrigated after the operation with quinine bichloride solutions and filled with emetine hydrobromide solution. At the same time the amebic colitis is treated in the usual manner. The multiple abscesses of bacteriemia are opened and drained; but the bacteriemia is usually so severe that treatment is not effective.

CANCER OF THE LIVER

Cancer of the liver occurs in two forms: secondary and primary cancer.

Secondary cancer of the liver is the most common form of migrated cancer or metastases from a cancer of the stomach, intestines, pancreas or other abdominal organs. It usually develops when the primary cancer has not been completely removed or when it is impossible to remove it. Primary cancer of the liver originates in the liver and is very rare.

Pathology: The liver usually becomes studded with numerous small or large cancerous masses which destroy and replace the liver tissue.

Symptoms: The symptoms of secondary cancer of the liver are local and general. The local symptoms are pain in the region of the liver, nausea, vomiting, and gradual development of jaundice. This is followed by progressive loss in weight and strength and characteristic cachexia with a severe secondary anemia.

At first the jaundice is slight, but as the cancer grows it becomes more marked and complete because cancer nodules obstruct the hepatic or common bile duct or the ducts within the liver. The liver is usually enlarged, tender, and feels very nodular.

Treatment: Secondary cancer of the liver is not amenable to treatment because other organs are already involved by the time the cancer affects the liver.

Radium and X-ray are frequently tried. For the severe pain, morphine in increasing doses is usually administered.

UNCOMMON DISEASES OF THE LIVER

ACUTE YELLOW ATROPHY OF THE LIVER

Acute yellow atrophy of the liver is a rare disease characterized by jaundice and severe toxic symptoms.

Cause: The disease results from phosphorus or arsenic or salvarsan poisoning or from delayed chloroform poisoning. It sometimes develops in pregnancy and in infections such as syphilis.

Pathology: The disease process is a severe degeneration of the liver cells. The liver becomes small, soft and flabby.

Symptoms: The symptoms begin with indefinite gastric symptoms, nausea and vomiting and slight jaundice lasting several days. The jaundice then gets more marked, persistent vomiting develops and the patient gets severe nervous symptoms, delirium, convulsions and finally coma, which may end in death. A characteristic feature of the disease is scanty urine which contains albumin and leucin and tyrosin, two unusual crystalline substances.

Treatment: The disease is treated by intravenous injections of saline solutions or glucose, by colon irrigations and sodium bicarbonate to neutralize the acidosis.

WEIL'S DISEASE

Weil's disease or Infectious or Epidemic Jaundice is a rare disease characterized by fever and jaundice and a large spleen and sometimes nervous symptoms. It is caused by a germ, the Spirochete Icterohemorrhagiciæ and occurs especially among soldiers and miners.

The disease is treated by a specific serum and like other forms of jaundice.

DISEASES OF THE PANCREAS

Physiology of the Pancreas

The pancreas is a long glandular organ situated in the back of the upper part of the abdomen, consisting of a head, body and tail. The head is surrounded by the duodenum. The organ is a digestive gland and a gland of internal secretion. The

external or digestive secretion of the pancreas is pancreatic juice which flows into the duodenum or first portion of the small intestine through two ducts, a long duct which runs the entire length of the pancreas known as the duct of Wirsung and a smaller duct which comes from the head of the pancreas, known as the duct of Santorini. These ducts join with the common bile duct to form the Papilla of Vater. This is the joint opening of the pancreatic duct and the common bile duct into the duodenum. The external secretion or pancreatic juice flows into the duodenum, where it completes the digestion of food. The process has already been described, see page 288.

The internal secretion of the pancreas is a substance called insulin, which is formed by small groups of cells within the pencreas known as Islands of Langerhans. The insulin is secreted into the blood stream and controls the utilization of sugar in the body. Diabetes is a disease characterized by insulin deficiency.

Symptoms of Pancreatic Disease

The symptoms of diseases of the pancreas are pain, general symptoms of indigestion, symptoms of pressure on the bile ducts and symptoms indicating disturbed function of the pancreas.

The pain of pancreatic disease is usually constant and is situated in the epigastrium or in the back.

The symptoms of indigestion are fullness, distention and sometimes nausea and vomiting. They have already been described with diseases of the stomach.

The symptoms of pressure on the bile ducts are jaundice and enlargement of the gall bladder. They are caused by diseases of the head of the pancreas such as tumors, which frequently obstruct the neighboring bile ducts.

The symptoms of disturbed pancreatic function are the presence of undigested fat and proteins in the stool, diabetes and emaciation. The stools are large and fluid and contain large quantities of undigested fats and protein food because the secretion of pancreatic juice, the main digestive juice, is diminished.

Diabetes or sugar in the urine results from the inability of the pancreas to produce insulin.

Emaciation is usually quite marked in pancreatic disease and results from the disturbed digestion and consequent failure to assimilate food, or from diabetes.

COMMON DISEASES OF THE PANCREAS

The most common diseases of the pancreas are acute pancreatitis, chronic pancreatitis and carcinoma of the pancreas.

ACUTE PANCREATITIS

Acute pancreatitis is an acute inflammation of the pancreas and its ducts. It is frequently associated with an acute inflammation of the bile ducts and the gall bladder, acute cholecystitis.

ACUTE HEMORRHAGIC PANCREATITIS

Acute Hemorrhagic Pancreatitis is a rare and serious disease of the pancreas, characterized by severe abdominal symptoms resulting from hemorrhage or gangrene of the pancreas.

Cause: The disease results when a gall stone passes along the common bile duct and obstructs the joint opening of the bile duct and pancreatic duct, the Papilla of Vater.

Pathology: As a result of the obstruction at the Papilla of Vater the bile flows into the pancreas instead of the duodenum. The pancreatic juice develops its digestive power only when it is mixed with bile or intestinal juice. Consequently when bile enters the pancreatic duct it activates the pancreatic juice and digests part of the pancreas. During this process blood vessels are opened and hemorrhages occur into the pancreas. Sometimes the digested part of the pancreas becomes gangrenous or forms an abscess.

Symptoms

The symptoms vary according to the severity of the disease. If a severe hemorrhage occurs into the pancreas the patient gets a very severe excruciating pain in the upper part of the abdomen. This is followed by constant and severe nausea and vomiting and severe collapse; a rapid thready pulse, cyanosis, shallow breathing, cold, moist skin, etc. Sometimes symptoms similar to intestinal obstruction develop. As a rule, the patient has had previous attacks of gall stones.

The physician finds extreme tenderness and rigidity in the upper part of the abdomen and marked distention. Frequently sugar is present in the urine and the examination of the blood shows an increased percentage of sugar in the blood. If the

patient is not operated, peritonitis, with all the usual symptoms, develops.

Treatment: The disease is treated by an immediate surgical operation. The shock is treated by stimulants and intravenous infusions of normal saline solution. The severe cases are usually fatal, but the mild cases frequently recover.

CHRONIC PANCREATITIS

Chronic Pancreatitis is a chronic disease of the pancreas characterized by the formation of scar tissue within the pancreas and disturbance in its function.

Cause: The disease is usually associated with chronic gall bladder disease, gall stones or inflammation or ulcer in the duodenum or stomach. It sometimes develops in arteriosclerosis.

Pathology: The disease process is a chronic inflammation which gradually destroys some of the glandular tissue within the pancreas and replaces it with connective tissue. As a result the secretion of pancreatic juice is diminished and if the Islands of Langerhans are also affected the secretion of insulin is diminished.

Symptoms

The symptoms result from failure to digest food in the intestines because the secretion of pancreatic juice is diminished. At first only fat digestion is affected and later protein digestion.

The principal symptoms are fullness, bloating, discomfort after eating, pain and loose bowel movements. The patient has three or four large bowel movements a day which have a foul odor and contain large quantities of fat and proteins such as meat. In many cases the urine contains sugar. Jaundice is a frequent symptom when the disease is associated with gall-bladder disease. The duodenal contents are frequently examined and they contain diminished or absent pancreatic ferments.

Treatment

The treatment consists of a suitable diet, the administration of pancreatic extracts and the treatment of the associated conditions.

The diet consists principally of carbohydrate foods, cereals, small quantities of proteins such as skimmed milk and practically no fats because fat digestion is markedly diminished. The food should be given frequently and in small quantities. To sup-

ply the absent or diminished pancreatic juice, pancreatic extracts are given, and if the diarrhea is marked, various astringent substances such as bismuth, tannigen, etc., are added. The associated conditions such as chronic gall-bladder disease or chronic inflammation of the duodenum are treated in the usual manner. Sometimes the duodenum is irrigated through a duodenal tube.

CANCER OF THE PANCREAS

Cancer of the pancreas is a common form of cancer. It occurs especially in the head of the pancreas and usually starts in the pancreatic ducts. The cause is unknown.

Symptoms: The symptoms of cancer of the pancreas may simulate any form of gall-bladder disease or disease of the stomach. The patient complains of various digestive symptoms, distention, fullness or pain for some time. The characteristic symptom, however, is the sudden occurrence of complete obstructive jaundice without pain or previous attacks of colic. The stools become clay colored and the urine is highly colored with bile. The jaundice is persistent and is associated with progressive loss in weight and strength, and cachexia. It is caused by obstruction of the bile duct by the cancer.

The gall bladder is usually enlarged, unless the patient has also had previous attacks of gall-bladder disease. When the cancer is extensive and involves the Islands of Langerhans in the pancreas sugar occurs in the urine and the sugar in the blood is increased. Sometimes the stools contain large quantities of undigested fat because secretion of pancreatic juice is diminished.

Complications: The most common complication is cancer of the liver which develops as migrated cancer nodules or metastases.

Treatment: The treatment is surgical. A cholecystenterostomy operation is performed which consists of sewing the gall bladder to a loop of small intestine. This relieves the obstructive jaundice by establishing a new opening between the gall bladder and intestines.

The disease is usually fatal because it is impossible to remove the pancreas without endangering the patient's life.

PANCREATIC CYSTS

A cyst sometimes forms in the pancreas. It is a rare condition and may cause constant pain in the pit of the stomach and form

a tumor which the physician is sometimes able to feel through the abdominal wall.

PANCREATIC STONES

Pancreatic Stones are small calcium phosphate stones which occasionally develop in the ducts of the pancreas. It is a rare condition which sometimes produces pain in the upper part of the abdomen or indefinite symptoms similar to those caused by gall-bladder disease or gall stones. It frequently causes chronic pancreatitis.

CHAPTER XXVI

DISEASES OF THE PERITONEUM

The Peritoneum

The peritoneum is a thin, serous membrane which lines the entire abdominal cavity and covers most of the organs in the abdomen, the intestines, stomach, liver, spleen and kidneys. The small intestine, stomach, liver, transverse colon, sigmoid and spleen are completely surrounded by the peritoneum. The kidneys, adrenal glands, pancreas, ascending and descending colon are only partly covered by peritoneum. The organs that are completely covered by the peritoneum are usually attached to the abdomen by mesenteries or ligaments. A mesentery is a thin membrane which consists of several layers of peritoneum between which are numerous blood vessels. It usually extends to the back of the abdomen and holds various organs in place. The stomach and intestines are the principal organs which are attached to the abdomen by mesenteries. The ligaments are short bands of fibrous tissue covered with peritoneum which attach some of the organs such as the liver and spleen to the back of the abdominal cavity. The peritoneum makes the entire abdominal cavity a serous sac which contains the abdominal organs. The organs that are completely surrounded by peritoneum can move about freely in the abdomen because they are covered by a smooth lubricated membrane.

PERITONITIS

Peritonitis is an inflammation of the peritoneum. It occurs in two forms: acute and chronic peritonitis.

ACUTE PERITONITIS

Acute Peritonitis is an acute inflammation of the peritoneum.

Clinical Forms: Acute Peritonitis occurs in two forms: Acute Diffuse Peritonitis and Acute Localized Peritonitis.

Acute Diffuse or Spreading Peritonitis is an inflammation of the peritoneum of the entire abdominal cavity. **Acute Localized Peritonitis** is an inflammation of the peritoneum in some part of the abdomen, usually around some organ. It is sometimes classified according to the cause as Gonococcus Peritonitis, Pneumococcus Peritonitis, Streptococcus Peritonitis, etc. Post-Operative Peritonitis is a form of peritonitis which follows an abdominal operation.

Cause: Acute peritonitis is caused by extension of an infection from an organ in the abdomen or perforation of a diseased hollow organ. The most common cause is perforation or gangrene in acute appendicitis. It also results from perforation of an intestinal ulcer in typhoid fever or perforation of a gastric ulcer. It may follow acute infections of the gall bladder, the Fallopian tubes and infections in other organs in the abdomen.

Pathology: The disease process is an acute inflammation of the peritoneum characterized by the formation of pus within the abdomen. The pus may be thin and resemble serum, it may contain fibrin or it may be thick, yellow and creamy. The inflammation begins around the causative diseased organ, the appendix, the intestine, stomach, gall bladder, uterus, etc. It may then become localized or spread over the entire abdomen and cause diffuse or spreading peritonitis.

Localized peritonitis usually results when the perforation occurs slowly or when the infection is mild or the patient's resistance is good. The infection is then prevented from spreading by formation of adhesions and an abscess forms around the causative organ, the appendix, the Fallopian tubes, etc.

Diffuse generalized or spreading peritonitis usually follows a severe infection or a sudden perforation or when the patient has poor resistance. The inflammation spreads rapidly from the site of perforation or causative disease to the entire abdominal cavity which rapidly becomes filled with pus.

Symptoms

The symptoms of acute peritonitis may be divided into three groups.

1. Symptoms of the Causative Disease.
2. Peritoneal Symptoms.
3. Toxic Symptoms.

Symptoms of the Causative Disease: The symptoms of acute appendicitis, typhoid fever, gastric ulcer, cholecystitis, etc., usually precede the onset of peritonitis.

Peritoneal Symptoms: When the infection in the diseased organ spreads to the peritoneum the symptoms of the original disease increase in severity. The pain becomes more severe and extends to other parts of the abdomen, vomiting develops, the abdomen becomes distended, the tenderness and rigidity increase and there is a rise in temperature and pulse rate.

The onset of a perforation in acute appendicitis, typhoid fever, gastric ulcer, etc., is indicated by a sudden sharp pain in the abdomen, nausea and vomiting, abdominal distention, constipation, and marked tenderness and rigidity of the abdominal muscles. If the peritonitis becomes localized the pain, tenderness and rigidity become localized in some part of the abdomen, the lower quadrant or the upper quadrant, and the nausea and vomiting cease. An abscess in the abdomen then gradually develops. The most common forms of localized peritonitis are appendicitis abscess and subphrenic abscess already described.

If the peritonitis spreads, the pain, tenderness and rigidity extend over the entire abdomen, the nausea and vomiting continue and the vomited material contains bile and later intestinal contents. The abdominal distention increases rapidly, and the bowels are markedly constipated.

When the physician examines the patient he usually finds a distended abdomen which is very tender and rigid. If the peritonitis is localized the tenderness and rigidity are confined to some definite area in the abdomen or an abscess is made out. If the peritonitis is general or spreading he finds the entire abdomen rigid and tender.

Toxic Symptoms: The toxic symptoms occur in general peritonitis and are usually very characteristic. The temperature rises to 102° or 103° F., and the pulse becomes rapid. The examination of the blood will show an increase in the number of leucocytes and in the number of polynuclear cells.

As the peritonitis increases the patient develops a characteristic appearance known as Hippocratic Facies. The expression is anxious and worried. The patient is alert, the eyes are bright, the cheeks are pinched and the nostrils dilate with respiration which is usually rapid. The patient often has a peculiar optimism, although he is desperately ill, and may often improve temporarily, even a few hours before death.

Course: Localized peritonitis or spreading peritonitis which is operated early usually recovers. The peritonitis that develops in the pelvis from gynecological conditions is usually mild and

may last a long time, but the patient ultimately recovers. The cases that are operated upon too late, and general peritonitis which develops after an operation, are usually fatal.

Treatment

The treatment of acute peritonitis is an immediate operation. The sooner the patient is operated upon the better are the chances for recovery. As a rule, if the operation is performed within the first twelve hours after the onset the chances for recovery are good, but after that they begin to diminish. The operation consists of opening the abdomen, finding the cause, removing it and draining the abdomen if necessary. If the cause is an acute perforated appendicitis, the appendix is removed, the wound is left partly open and drained until it heals. The operation for general peritonitis is usually more extensive. Some surgeons merely open and drain the abdomen while others wash out the pus with large quantities of normal salt solution.

Localized Peritonitis of the lower part of the abdomen following infection of the tubes and ovaries is treated by applying ice bags to the abdomen, by douches, baking and similar methods.

Post-operative Treatment: After the operation saline solution is frequently given by means of the Murphy Drip method or by hypodermoclysis to dilute the poisons and stimulate the patient. Stimulants such as adrenalin, strychnine, digitalis and similar remedies are usually given. If vomiting is persistent frequent gastric lavage is used. Colon irrigations or enemas are given to move the bowels, to stimulate peristalsis and remove poisons.

CHRONIC PERITONITIS

Chronic Peritonitis occurs in two forms, Chronic Fibrous Peritonitis and Tuberculous Peritonitis.

Chronic Fibrous Peritonitis

Chronic Fibrous Peritonitis is usually a sequel of acute peritonitis. It is characterized by the formation of fibrous tissue and adhesions in the abdomen.

Symptoms: The symptoms vary according to the location of the disease. As a rule the patient has cramplike pain in various parts of the abdomen, sometimes nausea and vomiting and constipation. When the adhesions form around the pylorus or gall bladder the symptoms of obstruction or ulcer of the stomach or

gall-bladder disease develop. Sometimes the adhesions form bands which may cause intestinal obstruction.

Treatment: The treatment consists of relieving the symptoms. The constipation is treated by a suitable diet, by various laxatives, mineral oil, agar agar and similar remedies and by colon irrigations. The stomach and gall-bladder symptoms are treated in the same manner as the forms of stomach and gall-bladder disease which they simulate. The intestinal obstruction and other mechanical difficulties in the intestines are usually treated by operation.

Tuberculous Peritonitis

Tuberculous peritonitis is a form of chronic peritonitis caused by the tubercle bacillus.

Cause: The disease usually results from extension of tuberculosis of the intestines or lymph nodes in the abdomen. It is more prevalent in young persons around the age of twenty-five or in children three to six years of age.

Pathology: The disease process occurs in two forms, an adhesive form and an ulcerative form. The adhesive form is characterized by development of fine tubercles on the peritoneum and the formation of adhesions between loops of intestines. Sometimes small pockets of clear fluid are formed in various parts of the abdomen.

The ulcerative form is characterized by the formation of tuberculous cheesy masses in the abdomen between loops of intestines. As a result the intestines become bound together and form irregular-shaped masses, or tuberculous abscesses form between loops of intestines.

Symptoms: The symptoms are variable and may be divided into two groups: abdominal symptoms and general symptoms of tuberculosis.

The abdominal symptoms are pain in various parts of the abdomen, distention, constipation or diarrhea. Sometimes intestinal obstruction develops.

The physician is frequently able to find areas of tenderness in the abdomen or masses consisting of adherent loops of intestines or localized areas of fluid in the abdomen. X-ray examination will often show loops of intestines bound together by adhesions.

The general symptoms are slight fever, marked loss in weight, anemia, and sometimes evidence of tuberculosis in other organs, the lungs, the Fallopian tubes, intestines, etc.

Treatment: The treatment consists of injecting oxygen into

the abdominal cavity and measures commonly used in tuberculosis; overfeeding, fresh air, rest, etc. Oxygen treatment is given by inserting a trocar into the abdominal cavity, withdrawing the fluid and then allowing oxygen from a tank to flow into the abdomen slowly. If this method is not successful the abdomen is opened to allow air to enter and then closed again.

If intestinal obstruction develops an operation is performed to relieve the obstruction.

CANCER OF THE PERITONEUM

Cancer occasionally involves the peritoneum. It usually occurs as migrated cancer or metastases from cancer of the ovary, stomach, liver or other organs. The cancer forms numerous nodules all over the peritoneum.

Symptoms: The symptoms are indefinite pains and distention of the abdomen, ascites, an accumulation of fluid in the abdominal cavity, and marked loss in weight and strength, and the usual cachexia of cancer. Sometimes cancerous nodules cause intestinal obstruction. The symptoms are usually associated with those of the original cancer or they occur a short time after an operation for cancer in one of the abdominal organs.

Treatment: The condition is not amenable to treatment, but if the ascites is very extensive the fluid is removed from the abdomen by tapping. Radium and X-ray treatment are also frequently tried.

ASCITES

Ascites is an accumulation of fluid in the abdomen.

Cause: The most common cause of ascites is usually obstruction in the portal vein or portal circulation. This occurs in cirrhosis or hardening of the liver or when a tumor, adhesions or large lymph nodes develop in the liver. Ascites also develops in cardiac decompensation when the veins in the abdomen become engorged with blood and serum passes into the abdomen from the blood vessels. It sometimes occurs in chronic nephritis when the kidneys are unable to eliminate water, and fluid accumulates in the abdomen as well as in other tissues. Ascites occurs in chronic peritonitis, and cancer of the peritoneum, as a result of irritation of the peritoneum.

Pathology: The abdomen contains a serous or bloody fluid. In cirrhosis of the liver decompensation and nephritis, the fluid

is serous, but in cancer the fluid is bloody. The quantity is frequently so large that it fills the entire abdomen.

Symptoms

Ascites is not a disease, but a symptom. When, however, the abdomen becomes distended with a large quantity of fluid other symptoms develop, such as shortness of breath, cyanosis and cardiac weakness, as a result of pressure against the heart. When the ascites is due to cancer the patient steadily loses weight and strength and develops the characteristic cachexia of cancer.

The physician usually recognizes ascites by a change in the sounds produced when the abdomen is tapped and by the fact that the fluid can be moved around from one side to the other.

Treatment

The treatment of ascites consists of treating the cause and removing the fluid if it is excessive or causes pressure symptoms. When decompensation is the cause, the ascites disappears when the heart action is improved. In nephritis when the secretion of urine is increased the ascites often disappears. In cirrhosis of the liver the ascites is treated by diet, diuretics, glucose, saline purgatives and if these measures are not effective the fluid is removed by tapping. The procedure has already been described under cirrhosis of the liver.

CHAPTER XXVII

DISEASES OF THE KIDNEYS AND URINARY TRACT

Physiology of the Kidneys

The kidneys are the principal excretory organs of the body. They are two bean-shaped organs situated in the lumbar region of the abdomen and consist of an outer part or cortex and an inner part or medulla. The cortex contains important microscopic structures called renal or Malphighian corpuscles. The medulla is arranged as small pyramids which open into a sac called the pelvis. When examined with a microscope the kidneys are found to consist principally of numerous narrow tubules, situated principally in the medulla. The tubules begin in the cortex as a microscopic sac called Bowman's capsule which surrounds the glomerulus, a fine tuft of terminal kidney capillaries. They then extend from Bowman's capsule into the medulla, forming several loops and gradually becoming wider until they reach the pyramids and empty into the pelvis of the kidney.

The function of the kidney is to excrete water, salts, protein waste products such as urea, uric acid, creatinin and various poisons and bacteria.

The Urine

The urine is an amber-colored fluid which is secreted by the kidneys. Normal urine has the following characteristics:

Color: Light or dark amber.
Daily Quantity: 1000 to 1500 c.c. (1 to 1½ quarts).
Transparency: Usually transparent.
Chemical Reaction: Faintly acid.
Specific Gravity: 1015 to 1020. The specific gravity varies with the concentration of solid substances. It is higher when the urine contains more solids and lower when it contains less. It sometimes varies at different times during the day.
Normal Constituents: Water.

Salts { sodium chloride. sulphates phosphates. potassium. magnesium. calcium. ammonium.

Protein waste { urea. uric acid. creatinin. purin substances.

Microscopic appearance: Occasional epithelial cells or crystals.

Normal Variations in Urine: The composition of the urine frequently varies according to the diet or season. The color and specific gravity of the urine depends on the quantities of salts and waste products which it contains. If the urine contains large quantities of salts or waste products the color is dark and the specific gravity is higher, but if these substances are diminished the color is lighter and the specific gravity lower.

The daily quantity of urine varies with the quantity of fluids taken. When persons drink large quantities of fluids the quantity of urine is increased and vice versa. The quantity of urine is greater in winter than in summer because perspiration is increased in warm weather and fluid is therefore excreted by the skin.

Care of Urine Specimens: The nurse frequently has to collect urine specimens for examination in the laboratory. The specimens should be collected in clear receptacles and sent in clean bottles tightly corked and properly labeled with the patient's name, ward or room, date and time.

When the physician orders the daily output of urine to be measured, every specimen passed should be measured and poured into a large clean bottle. The total quantity is sometimes sent to the laboratory for examination. When urine is allowed to stand for some time it frequently decomposes. Consequently various antiseptics such as thymol, toluol, cresol or bichloride of mercury are added to the urine to prevent decomposition. The added antiseptic should be marked on the label before the specimen is sent to the laboratory. The urine of patients suffering with infectious diseases should always be disinfected by various antiseptics.

Urine Analysis: The analysis of the urine is the most important method of recognizing diseases of the kidneys. The urine is examined by chemical, microscopical and bacteriological methods. The nurse frequently has to examine the urine for albumin, sugar or acetone. It is beyond the scope of this book to discuss the methods of analysis in detail.

Urinary Changes in Disease

Frequently characteristic changes occur in the urine in various diseases, especially in diseases of the kidneys and urinary tract. The normal constituents of the urine may be increased or diminished or the urine may contain abnormal substances.

Changes in Normal Constituents: The daily output of urine and the specific gravity is increased in fevers and in acute nephritis. The quantity is increased in diabetes and in some forms of chronic nephritis. The other changes in the urinary constituents which occur in disease are indicated in the table and will be described under the various diseases.

Abnormal Constituents of the Urine: The most common abnormal constituents of the urine are albumin, sugar, acetone, diacetic acid, blood, pus and casts. Albumin is the most common abnormal substance in the urine. It probably appears in the urine by passing into the kidney from the serum of the blood. The presence of albumin in the urine is always an indication of serious diseases of the kidney, especially nephritis.

Orthostatic albuminuria is a condition in which albumin occurs in the urine only when the patient is in an upright posture, but it disappears entirely after sleep or lying down for a while.

Sugar or glucose in the urine is usually an indication of diabetes.

Acetone and diacetic acid occur in the urine when fats are not sufficiently oxidized in the body. The incompletely oxidized fatty acids are eliminated in the urine.

Blood may appear in the urine as small clots or in small flakes. It sometimes occurs in such small amounts that it can only be recognized by microscopic examination or by very delicate chemical tests. When hemoglobin is present the urine is bright red in color and transparent. Pus appears as a thick sediment which makes the urine cloudy.

Abnormal Microscopic Appearance of Urine: The most common abnormal constituents found in the urine by microscopic examination are casts, pus, cells, red blood cells and bacteria.

Casts are tiny microscopic molds of some of the tubules. They are of several kinds: hyaline, granular, epithelial and blood casts. Hyaline casts are smooth and homogenous in appearance. Granular casts are hyaline casts to which fine granules have become attached. Epithelial casts are casts to which epithelial cells have become attached. Pus appears as numerous leucocytes or white blood cells. Red blood cells may also be recognized on microscopic examination. Bacteria frequently occur in the urine and may be recognized by staining slides of the urinary sediment or by various bacteriological methods of examination.

URINARY CHANGES IN DISEASE

Changes in Normal Constituents

	Increased	Diminished
Daily quantity:	Diabetes Diabetes Insipidus Chronic Nephritis (some forms)	Fevers Acute Nephritis (some forms) Persistent Vomiting Diarrhea
Specific Gravity:	Fevers Diabetes Chronic Nephritis (some forms)	Chronic Nephritis (some forms) Diabetes Insipidus
Transparency:		Cloudy: Excessive phosphates; Pus fron infections of urinary tract; Blood
Chemical Reaction:		Alkaline: In pus-forming infections of urinary tract; When urine decomposes; Excessive vegetable diet
Salts:	Phosphates increased in nervous conditions and from fruit and vegetable diet	Chlorides reduced in fevers, especially pneumonia Nephritis with edema Starvation
Protein Waste: Uric acid Urea Creatinin	High protein diet	Chronic Nephritis (some forms) Vomiting Starvation

Abnormal Constituents

Substance	Disease or Condition
Albumen	Nephritis Pus-forming infections of urinary tract
Glucose	Diabetes
Acetone	Acidosis
Diacetic Acid	Acidosis
Bile	Jaundice
Ammonia	Infections of urinary tract or decomposed urine
Pus	Infections of urinary tract
Blood	Acute Nephritis Stone, Infections, Tuberculosis or New Growths of urinary tract Bladder diseases
Casts:	All forms of nephritis
Indican:	Intestinal putrefaction
Leucin and Tyrosin:	Acute yellow atrophy of liver

Symptoms of Diseases of the Kidneys

The symptoms of diseases of the kidney may be divided into four groups: clinical symptoms, disturbances in urination, urinary changes and evidence of disturbed kidney function, as obtained by various tests.

Clinical Symptoms: The clinical symptoms are pain and the symptoms of retained waste products; edema and uremia.

The pain may be dull or cramplike and is usually situated in the right or left lumbar region or in the abdomen. It frequently radiates to the back or into the groin. The pain may occur when the patient urinates or it may be relieved by passing urine.

Edema is one of the most important symptoms of diseases of the kidneys, especially nephritis. It is due to accumulation of serum in the tissues, which results when the kidneys are unable to eliminate salts and water. The edema usually begins in the ankles and legs when the patient is up and about and on the back when he is in bed. It gradually extends over the entire body, the face, arms, abdomen and in the chest and abdominal cavities.

Uremia is a condition caused by retention of poisons in the blood which are usually eliminated by the kidneys. It is associated with retention of protein waste substances; urea, uric acid and creatinin. It causes a definite group of symptoms which will be described with nephritis.

Disturbances in Urination: The disturbances of urination are chiefly an increase or diminution in the daily output of urine and various changes in the frequency and character of urination. The following terms are used to describe changes in the urinary output and disturbances in urination:

Oliguria is a diminished daily output of urine.

Polyuria is an increased daily output of urine.

Nocturia is frequent urination at night.

Dysuria is painful urination.

Anuria or suppression of urine is a condition in which the kidneys do not excrete any urine at all.

Intermittent urination is increased urination alternating with diminished urination.

Urinary Changes: The changes in the character of the urine vary with the disease of the kidneys. In some diseases the color, specific gravity or reaction is changed or the normal constituents may be increased or diminished. In other diseases of the kidneys the urine contains abnormal constituents, pus, blood, albumin,

and other substances. The substances characteristic of the various diseases of the kidneys are indicated in the table on page 386.

Kidney Function Tests

The physician frequently attempts to determine the functional ability of the kidney by means of various tests. In some of the tests the procedures are carried out by the nurse.

The object of kidney function tests is as follows:

1. To determine if waste products that are normally eliminated by the kidneys are retained in the blood.
2. To determine if the kidney is able to eliminate water or dissolved solid substances.
3. To determine the ability of the kidney to eliminate dyes and other substances.

Blood Test for Retention of Protein Waste Products: This is a test to determine the ability of the kidney to elminate waste products of protein metabolism, such as urea, uric acid and creatinin. A specimen of blood is obtained in the morning before breakfast from an arm vein. The quantities of urea, uric acid and creatinin which it contains is then determined by various chemical methods. They are increased in the blood in certain forms of nephritis or conditions which obstruct the ureters.

Water Test: This is a test to determine the ability of the kidney to eliminate water and is performed as follows:

The patient passes a specimen of urine in the morning before breakfast. Six glasses or 1500 c.c. of water are then given within a half to three-quarters of an hour. The patient must remain in bed and pass a specimen of urine every half hour. The nurse measures the quantity passed each time and takes its specific gravity.

A normal person eliminates the entire 1500 c.c. of water within four hours and most of it in the first two specimens, sometimes as much as 400 or 500 c.c. in each. The specific gravity of these specimens is very low, about 1001 and 1002, but it rises in the subsequent specimens. If the kidney function is disturbed, the water is eliminated very slowly and the specific gravity of the last specimens is only slightly increased.

Concentration Test: This is a test to determine the ability of the kidney to eliminate dissolved solid waste products and is performed as follows: The patient is given a diet containing no liquids for twenty-four hours. During this time the nurse collects a specimen of urine every two hours and its specific gravity is taken. In a normal person the quantity of urine is gradually diminished and its specific gravity becomes increased to about

1030 or more. If the kidney function is disturbed the specific gravity does not change very much and normal quantities are passed.

Mosenthal Test: This is a test to determine the ability of the kidney to eliminate all the waste products usually excreted by the kidney, such as salt, water and waste substances. The test consists of analyzing the entire twenty-four-hour specimen of urine for all its constituents while the patient is kept on a special diet containing definite quantities of all the food principles.

All medication is stopped before beginning the test and no food or water is given by mouth after midnight of the day preceding the test.

The food is prepared in the diet kitchen and is cooked without salt, but 10 grams of salt are given with the food or in three capsules, one for each meal. All the food is given only at meal times and must be weighed accurately before being served. The quantities not eaten should also be weighed and subtracted and the food which the patient actually eats should be recorded accurately. After the last meal no food or water is given until 8 A.M. the following morning.

The diet usually given is as follows:

Breakfast

Boiled oatmeal	100 Gms.
Sugar on cereal	1-2 teaspoonfuls
Milk on cereal	30 c.c.
Bread: 2 slices	30 Gms. each
Butter	20 Gms.
Coffee	160 c.c.
Milk in coffee	40 c.c.
Sugar in coffee	1 teaspoonful
Milk	200 c.c
Water	200 c.c.

Dinner

Meat soup	150 c.c.
Beef steak	100 Gms.
Potatoes (baked, boiled or mashed)	120 Gms.
Green vegetables as desired, any amount	30 Gms. each
Bread, 2 slices	20 Gms.
Butter	180 c.c.
Coffee or tea	20 c.c.
Sugar in coffee or tea	1 teaspoonful
Water	250 c.c.
Tapioca or rice pudding	100 Gms.

Supper

2 eggs, boiled or poached or any style	
Bread, 2 slices	30 Gms. each
Butter	20 Gms.
Tea	180 c.c
Milk in tea	20 c.c
Sugar in tea	1 teaspoonful
Fruit (stewed or fresh)	300 c.c 1 portion
Water	250 c.c

On the day of the test a specimen of urine is collected every two hours beginning at 8 A.M. The first specimen is discarded, but the subsequent ones are labeled as follows, and sent to the laboratory for examination:

1.— 8-10 A.M. specimen.
2.—10-12 noon specimen.
3.—12 noon to 2 P.M. specimen.
4.—2-4 P.M. specimen.
5.—4-6 P.M. specimen.
6.—6-8 P.M. specimen.

All the urine passed during the night after 8 P.M., and including the specimen passed at 8 A.M. the following morning, is collected in a large bottle and is labeled 8 P.M. to 8 A.M. specimen.

The urine is carefully examined in the laboratory to determine its specific gravity, and the quantities of all its constituents. A normal person eliminates all the salt taken in the diet, normal quantities of protein waste products, and the specific gravity shows the normal variations.

If the kidney function is disturbed, the analysis of the urine will show diminished excretion of salt, water or protein waste substances.

Phenolsulphonephthalein Test: This is a test to determine the ability of the kidney to eliminate phenolsulphonephthalein, a complex dye, and is performed as follows:

The patient is given 1 or 2 glasses of water in the morning before breakfast. A half hour later the bladder is emptied by passing urine or catheterization if necessary. A hypodermic injection of 1 c.c. of a special solution containing 0.06 gm. of the dye is then given in the lumbar region. The patient is told to pass a few c.c. of urine; five, seven and ten minutes after the

injection. Each specimen is tested with a 10% solution of sodium hydroxide. As soon as the dye appears in the urine the color turns red. Sometimes a catheter is inserted into the bladder and the urine is allowed to flow into a test tube containing the sodium hydroixde solution. The time when the urine first turns red should be noted. A specimen of urine is then obtained one hour, and another one two hours after the first appearance of the red color, either by catheterization or by allowing the patient to void.

The specimens are compared with standard solutions containing definite quantities of the dye. A normal person excretes 40 to 60% of the dye in the first hour and 60 to 80% in the second hour. If the kidney function is disturbed less than 40% of the dye is eliminated within two hours.

Urea Test: The urea test is a test to determine the ability of the kidney to eliminate urea and is performed as follows: The patient passes a specimen of urine in the morning and immediately after he is given a drink of 100 c.c. of water containing 15 grams of urea. A specimen of urine is then obtained one hour later and another one two hours later. Each specimen is examined in the laboratory to determine the quantity of urea which it contains. A normal person eliminates more than 2% of urea in each specimen. If the kidney function is diminished each specimen will contain less than 2% urea.

Functional Index: This is a test to determine the function of the kidney by comparing the quantity of urea in the blood with the nitrogen, urea and ammonia in a twenty-four hour specimen of urine. The urine is collected for twenty-four hours and the entire specimen is sent to the laboratory where it is examined for nitrogen, urea and ammonia. At the end of twenty-four hours a specimen of blood is obtained from an arm vein and is examined for urea.

Symptoms to be Observed by the Nurse

When nursing diseases of the kidneys the nurse should observe and record the following symptoms and urinary changes:

1. The daily output of urine.
2. The character of urination, whether it is frequent, nocturnal or painful.
3. The appearance of the urine, whether it is clear, cloudy or contains pus, blood, stones or other constituents.
4. The presence of abnormal constituents in the urine.

The nurse frequently has to test the urine for sugar, acetone, or albumin, and sometimes to take the specific gravity and the reaction.

5. Pain: whether it is present or absent, its location, character and radiation.
6. Edema: its location, extent and whether it is increasing or diminishing.
7. Uremic symptoms: whether there is headache, vomiting, drowsiness, twitching of muscles or convulsions.

COMMON DISEASES OF THE KIDNEYS

Diseases of the kidneys may be divided into medical and surgical diseases. The medical diseases are the diseases of the kidney which are usually treated by medical methods and are chiefly the various forms of nephritis. The surgical diseases of the kidney are those which are treated principally by surgical operations or instrumental procedures. They are usually associated with diseases of the urinary tract and are principally stones, infections of the urinary tract and kidney tumors, etc.

UREMIA

Uremia is a condition which develops in acute or chronic nephritis, when the kidney is unable to eliminate certain waste products or poisons. The specific substances which cause uremia are unknown, but it occurs principally whenever protein waste products are retained in the blood. It occurs in two forms: (1) Acute uremia, (2) Chronic uremia.

Acute uremia occurs suddenly and is characterized by convulsions.

Chronic uremia occurs gradually and is characterized by drowsiness, stupor and coma.

Acute Uremia

Acute uremia usually develops in severe cases of acute nephritis or in the form of nephritis which occurs during pregnancy. It is believed to be due to a sudden edema or swelling of the brain.

Symptoms

The principal symptom is a characteristic convulsion, lasting a few minutes. It begins with intense headache and twitching

of the muscles of the leg, face, or arms. The patient then suddenly becomes rigid, the entire body becomes stiff, the legs and arms are extended and the eyes twitch. This lasts but a moment and is followed by clonic contractions of the muscles, that is, repeated jerking contractions of the muscles of the arms, legs, face and eyes. The attack resembles an epileptic fit and the patient may bite the tongue. When the convulsion is over the patient feels exhausted, falls asleep and may go into a stupor or even coma.

At first the convulsions are very mild, but as the disease progresses, they increase in frequency and severity and the patient may die in one of them.

Unusual Symptoms: Sometimes there are no convulsions, but only twitching of the arms or of an arm and leg on one side of the body. Some patients become delirious or maniacal.

Treatment

When uremic convulsions occur the patient is usually kept in bed. During the attack the nurse should place a spoon or some other object between the teeth to prevent biting the tongue, and the patient should be placed in such a position as to avoid injury.

The convulsions are treated by chloroform or ether inhalations. To prevent their recurrence, chloral, luminal and bromides are usually administered. Various saline purgatives such as Epsom salt, Pluto water, citrate of magnesia or similar substances are given to eliminate the poisons by the bowels. Some physicians remove about a pint of blood by venesection. A lumbar puncture is sometimes performed to remove fluid from the spinal canal because it is believed that the convulsion is due to an acute swelling of the brain as part of the general edema or accumulation of fluid throughout the body.

Chronic Uremia

Chronic uremia usually occurs in the course of chronic nephritis, especially when protein waste products are retained in the blood.

Symptoms

The symptoms develop gradually, beginning with weakness and loss in weight, which steadily increase. The patient then complains of continual headache and becomes irritable, dull and stupid. The objective signs are characteristic; the skin is dry, the tongue is coated, and the breath has an odor of urine and

sometimes there are twitching of muscles. The respiration becomes irregular and the temperature subnormal. As the condition progresses drowsiness increases to stupor and gradually the patient goes into coma and may die.

Treatment

Chronic uremia must be treated energetically because of the possible outcome. The treatment consists essentially of a suitable diet, and measures and remedies to stimulate excretion of waste products by the skin and bowels.

The diets commonly used are a low protein diet or Karell Diet consisting of 1000 c.c. of milk in twenty-four hours.

The patient is made to perspire profusely by hot packs, warm baths, an electric light cradle, or by injections of pilocarpin, to stimulate excretion by the skin.

Saline purgatives such as Epsom salts, Pluto water, citrate of magnesia or similar substances are given to produce frequent bowel movements, thereby eliminating poisons through the bowels.

Some physicians order a Murphy Drip containing normal salt solution or water or hypodermoclyses of normal salt solution to dilute the poisons. A pint or more of blood is sometimes removed from a vein by venesection to remove the causative poisons.

Diuretics such as caffein, theobromine, theocin, theophylline, agurin, salyrgin, euphyllin and sodium acetate, sodium bitartrate, sodium citrate, are often given to increase the flow of urine. Digitalis is also given to stimulate the flow of urine and improve the circulation. If these are not effective intravenous injections of glucose solutions or novasurol are given to increase the flow of urine.

NEPHRITIS

Nephritis is an inflammatory disease of the kidneys which affects their structural elements and disturbs the function of the kidneys. It occurs in two forms: acute nephritis and chronic nephritis.

ACUTE NEPHRITIS

Acute nephritis is an acute inflammation of the kidneys which affects many of their structural elements and interferes with the secretion of urine and elimination of waste products.

Cause: The disease occurs as a complication of certain acute

infectious diseases and toxemias, principally scarlet fever and acute tonsillitis. It is a common complication in pregnancy. It also develops in other acute infections such as bacterial endocarditis, septicemia, typhoid fever, or diphtheria. It is frequently caused by bichloride of mercury or carbolic acid poisoning. Sometimes acute nephritis develops without any apparent cause except exposure to wet and cold.

Pathology: The disease is an acute inflammation in the kidneys caused by streptococci or other bacteria or other poisons, which are constantly being eliminated by the kidneys in scarlet fever and acute tonsillitis. The inflammation usually affects principally the glomeruli of the kidneys, but sometimes the entire kidney is involved. The glomeruli become dilated and filled with red and white blood corpuscles. Some of the fine capillaries in the glomeruli become blocked or contracted.

Bichloride of mercury poisoning usually causes degeneration of the tubules, which become blocked, and subsequently the glomeruli become involved.

Classification: Acute nephritis is sometimes classified according to the nature and extent of the structural changes into three forms as follows:

1. Acute glomerular nephritis, in which the disease process is confined principally to the glomeruli.
2. Acute diffuse nephritis, in which the disease involves the entire kidney.
3. Acute embolic nephritis, a special form occurring in acute tonsilitis or in bacterial endocarditis, characterized by small clots or emboli in the glomeruli of the kidneys.

Symptoms

The symptoms of acute nephritis result principally from inability of the kidneys to eliminate waste products and may be divided into the following four groups:

1. Mode of Onset.
2. Urinary Changes.
3. Symptoms of Retained Waste Products.
4. Associated Symptoms.
5. Laboratory Evidence of Disturbed Kidney Function.

Mode of Onset: The symptoms develop suddenly or gradually and in various ways. In acute tonsillitis or bichloride of mercury

poisoning they develop in a few days. In scarlet fever the symptoms usually appear at the end of the second or beginning of the third week.

The disease usually begins with a rise in temperature or the continuation of the symptoms of the causative disease, scarlet fever or tonsillitis. Gradually the ankles become swollen, the face becomes puffy, and the daily quantity of urine is diminished. The specific gravity of the urine rises daily and contains albumin and casts. These symptoms continue throughout the disease and may get steadily worse.

Sometimes the disease begins suddenly with a chill, high fever, pain in the back, headache, nausea and vomiting, and intense weakness and drowsiness.

In pregnancy the disease sometimes begins with an attack of acute uremia. The daily quantity of urine becomes very scanty and the patient gets a sudden uremic convulsion.

Urinary Changes: The urinary changes are characteristic. The daily output of urine becomes markedly diminished (oliguria), the specific gravity is increased to 1030 or more, and the urine contains albumin, blood and hyaline, granular or blood casts.

Symptoms of Retained Waste Products: The symptoms which indicate disturbed kidney function are edema, uremia, and the results of kidney function tests.

Edema is one of the most important symptoms of acute nephritis. It is due to an accumulation of salt and water in the tissues which the kidneys cannot eliminate. At the onset of the disease only the ankles are swollen and the face becomes puffy or if the patient is in bed the edema occurs first on the back. As the disease progresses the edema extends over the entire body, the extremities, the back, and the genitals. Finally fluid accumulates in the serous cavities such as the chest or abdomen.

Acute uremia frequently occurs in severe cases of acute nephritis, especially those developing in pregnancy. It begins with headache and a sudden rise in blood pressure. The patient then suddenly develops twitching of the muscles or convulsions. In severe cases the convulsions occur frequently and the patient may die in one of them.

Chronic uremia occasionally develops in prolonged cases. It is characterized by severe headache, weakness, vomiting and finally coma.

Associated Symptoms: The most common symptoms associated with acute nephritis are high blood pressure and anemia.

The blood pressure usually rises early in the disease, and the systolic pressure reaches 170 to 180 mm. of mercury or more. As the disease improves the blood pressure gradually subsides.

The anemia is usually very severe and the pallor of acute nephritis is very characteristic. The examination of the blood shows a marked reduction in the number of red blood cells and the percentage of hemoglobin.

Nausea and vomiting may occur in the course of the disease as a symptom of uremia or edema of the gastrointestinal tract.

Laboratory Evidence of Disturbed Kidney Function: As the disease progresses the physician determines the functional capacity of the kidney by the various kidney function tests. In mild cases the kidney function is not disturbed. In severe cases the examination of the blood will show a marked increase in protein waste products such as urea, uric acid and creatinin. If this persists it is usually a very unfavorable sign. The water, concentration, phenolsulphonephthalein and other tests will also indicate a marked disturbance in kidney function, which is usually in proportion to the severity of the disease.

Course and Sequellæ: The majority of cases usually get well and leave no permanent injury in the kidney. Improvement is indicated by the disappearance of the edema, the increase in the daily output of urine, disappearance of uremic symptoms and evidence of improved kidney function as indicated by the various tests. Some of the cases following scaret fever frequently develop chronic nephritis.

Treatment

Acute nephritis is treated by the following methods:

1. Prevention.
2. Nursing Care.
3. Diet.
4. Causative Treatment.
5. Symptomatic Treatment.

Prevention: The preventive treatment of acute nephritis consists of proper treatment and care of cases of scarlet fever and tonsillitis and proper hygiene in pregnancy. In these diseases the urine should be examined frequently to recognize the disease as early as possible. The patient should be kept on a diet containing a minimum amount of protein to conserve kidney function by limiting protein waste. In scarlet fever the early use of scarlet fever antitoxin may prevent acute nephritis as a complication. Patients who have repeated attacks of acute tonsillitis

should have their tonsils removed because acute nephritis may follow one of the attacks.

Nursing Care: The patient should be kept in bed and as warm as possible until all the symptoms have disappeared and the daily output of urine is normal. The nurse should measure and record the daily quantities of urine and its appearance when passed. She should note the location and extent of the edema and watch especially for the symptoms of acute or chronic uremia, such as headache, twitching, convulsions, drowsiness, nausea, vomiting, etc.

Diet: The diets commonly used for acute nephritis contain minimum amounts of protein to conserve the function of the kidney and limited quantities of fluid and salt to relieve edema. The following are examples of diets used in nephritis.

The Karell Diet: This consists of 1000 c.c. of milk in twenty-four hours, that is, four glasses of milk a day. It is relatively low in protein and contains a limited amount of fluid.

Low Protein Diet: This consists principally of fresh fruits, vegetables, cereals and cream. A suitable menu may be made up from the foods in the following table:

Foods with Low Protein Content

Cereals	Dairy Foods	Vegetables	Fruits
Farina	Cream	Beets	Strawberries
Corn flakes	Cream cheese	Celery	Grapefruit
Wheatena	Butter	Squash	Pineapple
Rice	Eggs	Endive	Apricots
Puffed rice		Turnips	Bananas
Oatmeal		Lettuce	Oranges
		Cabbage	Peaches
		Carrots	Apples
		Potatoes	Grapes
		Tomatoes	Plums
		Asparagus	Pears
		Mushrooms	
		Green peas	
		Water cress	
		Cauliflower	
		String beans	

Salt Free Diet: This diet is given to relieve edema and consists of foods containing minimum quantities of salt. When salt is eliminated from the diet the salt content in the tissues is reduced. As a result fluid is eliminated by the kidneys in order

to maintain a normal percentage of salt in the body. The diet may be made up from the foods in the following table:

Foods with Low Salt Content

All foods to be cooked without adding salt

Cereals	Dairy Foods	Vegetables	Fruits
Farina	Eggs	Tomato	Strawberries
Cream of Wheat	Cream	Endive	Grapefruit
Rice	Milk	Squash	Pineapple
Oatmeal		Lettuce	Apricots
		Cabbage	Cherries
		Turnips	Peaches
		Potatoes	Bananas
		Mushrooms	Pears
		Water cress	Plums
		String beans	

Causative Treatment: The acute nephritis caused by mercury poisoning or other metals is treated by intravenous injections of sodium thiosulphate. The form caused by scarlet fever is sometimes treated by scarlet fever antitoxin.

Symptomatic Treatment: The symptoms which are usually treated are the edema, the high blood pressure, and retention of protein waste products.

Edema is treated by diet, various physical methods and by certain remedies. The diets ordered for edema are the Karell diet or the salt-free diet. Some physicians treat edema by limiting the daily intake of fluid to 1000 c.c. in mild cases and to 500 c.c. when the edema is extensive. When the intake of fluid is limited the body utilizes the fluid in the tissues, thus relieving the edema.

The physical methods used to relieve edema are hot packs, an electric cradle, warm baths, or similar measures which produce perspiration. The remedies commonly given are various saline purgatives in large doses such as magnesium sulphate, citrate of magnesia, sodium sulphate, etc., to produce fluid bowel movements, and thyroid extract to accelerate metabolism.

High blood pressure usually subsides when the acute nephritis improves. If the blood pressure causes symptoms such as headache or dizziness some physicians order nitroglycerin or other forms of nitrites, luminal, chloral and similar remedies.

Retention of protein waste products is treated by stimulating excretion through the skin and gastrointestinal tract, diluting the

poisons and sometimes by diuretics. To increase perspiration hot packs or electric cradles are used or pilocarpine is given hypodermically. To increase excretion by the gastrointestinal tract saline purgatives are given such as Epsom salt, sodium sulphate or citrate of magnesia in sufficient doses to cause fluid bowel movements. Some physicians order gastric lavage and colon irrigations. Normal saline solution is sometimes given by hypodermoclyses or Murphy drip to dilute the poisons.

In prolonged cases some physicians order diuretics such as theobromine, theocin, theophyllin, salyrgin, euphyllin, diuretin, agurin, sodium acetate or citrate, or digitalis. Glucose or novasural is often given intravenously to increase the flow of urine.

Acute or chronic uremia is treated in the usual manner, described on page 394.

Surgical Treatment: In severe cases of acute nephritis when other methods of treatment fail, a decapsulation operation is performed. This operation consists of stripping off the capsule of the kidney to allow adhesions to form and new blood vessels to grow into the kidney, thereby improving its function.

CHRONIC NEPHRITIS

Chronic Nephritis or Bright's Disease is a chronic inflammatory disease of the kidneys in which the structural elements are affected and the kidney gradually becomes unable to eliminate waste products.

Clinical Forms: Chronic nephritis is best classified from the clinical and nursing standpoint according to the symptoms which result when the function of the kidneys is disturbed, as follows:

1. Chronic nephritis with normal kidney function.
2. Chronic nephritis with retention of salt and water.
3. Chronic nephritis with retention of protein waste products.
4. Cardio-vascular-renal disease, a combination of nephritis and heart disease.
5. Nephrosis, a disturbance of metabolism characterized by edema and large quantities of albumin in the urine.

The disease is also classified according to the structural changes in the kidneys as chronic parenchymatous and chronic interstitial nephritis. Chronic parenchymatous nephritis is the form characterized by retention of salt and water, and chronic

interstitial nephritis the form characterized by retention of protein waste products.

The disease is often described according to the elementary structural changes in the kidney as follows: Glomerular nephritis is a form of nephritis in which the disease process begins in the glomeruli in the kidney. Tubular nephritis is a form in which the changes occur principally in the tubules. Arteriosclerotic nephritis is a form which begins with ateriosclerosis of the kidney.

Cause: Chronic nephritis may follow the acute nephritis of scarlet fever or other infections, or result from continued absorption of pus from focal infections in the teeth, tonsils or other organs. It may develop as the end result of continued high blood pressure, chronic arteriosclerosis of the blood vessels in the kidney or chronic heart disease. It is sometimes caused by continued irritation of the kidney by waste products which result from eating excessive proteins. It is a common condition in old age, merely as a natural end result of the continued wear and tear on the kidney structures.

Pathology: The disease process consists of destructive changes in the blood vessels, the glomeruli, and the tubules, with the formation of connective tissue in the affected areas. In arteriosclerosis, in focal infections, or in scarlet fever, the process begins in the glomeruli, and gradually involves all the other structures of the kidney. As the disease progresses the kidney becomes small, scarred and contracted. At first the function of the kidney is not disturbed because a considerable portion of the kidney may be destroyed without interfering with its function. When the structural changes are sufficiently extensive, however, the kidney is unable to excrete waste products sufficiently and symptoms of disturbed function result.

Symptoms

The essential symptoms of chronic nephritis are albumin and casts in the urine, changes in its specific gravity, variation in the daily output, frequent urination, especially at night, and sometimes high blood pressure and anemia. The blood pressure is usually increased to 160 to 200 millimeters or more, and causes headaches, dizziness and sleeplessness. The anemia is quite marked, the skin and mucous membranes are pale and the red blood corpuscles and hemoglobin are markedly reduced. These may be the only symptoms for years. As the disease progresses, however, and in many cases even from the start, various other

symptoms develop as the kidney gradually becomes unable to eliminate waste products. The disease then occurs in various forms according to the functional disturbance of the kidney.

Chronic Nephritis with Salt and Water Retention

Symptoms

The principal symptom of this form of nephritis is edema. This is associated with characteristic changes in the urine and high blood pressure.

Edema: The edema is due to the retention of salt and water in the tissues. At first only the ankles become swollen and the face becomes puffy, but if the patient is in bed the edema occurs first on the back. It gradually becomes more extensive; the legs, the abdominal wall and in males the scrotum, become swollen. Finally there is an accumulation of serum in the chest (hydrothorax) and in the abdomen (ascites).

Urinary Changes: The daily output of urine is usually diminished and the specific gravity is high, 1025 to 1030 or more. The urine contains large amounts of albumin, hyaline and granular casts.

Functional Disturbance: The kidney function tests will show a retarded elimination of water and salt and failure to concentrate urine. Acute uremia may develop in this form of nephritis from edema or swelling of the brain.

Chronic Nephritis with Protein Waste Retention

This form of chronic nephritis frequently results from arteriosclerosis, though it may develop from other causes as well. There may be no functional disturbance for years.

Symptoms

The principal symptoms are characteristic changes in the urine, high blood pressure and symptoms of retained protein waste substances. There is usually no edema unless complications develop.

Urinary Changes: The daily output of urine is usually increased, sometimes to as much as 3000 or 4000 c.c. The patient has frequent urination and often has to get up at night to urinate. The urine has a low specific gravity, about 1005 to 1010, and it contains only traces of albumin and occasional casts, which are usually hyaline in character.

Symptoms of Retained Protein Waste: At first the patient

complains chiefly of progressive loss in weight and strength. This is followed by headache and dizziness, and sometimes nausea and vomiting.

The kidney function tests show a retention of protein waste substances in the blood which is indicated by an increase in the quantities of urea, uric acid and creatinin. The other kidney tests also show deficient elimination of protein waste substances.

Chronic uremia commonly occurs in this form of nephritis and causes headache, drowsiness, twitchings, stupor, and finally coma.

Combined Form of Nephritis

In chronic nephritis of long standing the kidneys are unable to eliminate all waste substances. As a result the patient develops the symptoms of both forms: edema, and the symptoms of chronic uremia such as headache, dizziness, drowsiness, etc., characteristic urinary changes and high blood pressure.

Complications

The most common complications of chronic nephritis are enlargement and decompensation of the heart and albuminuric retinitis.

Cardiac Complications: The persistent high blood pressure which is a constant symptom of chronic nephritis gradually causes changes in the heart and blood vessels. The increased resistance which the high blood pressure offers to the heart action causes gradual enlargement of the heart and thickening of the left ventricle. As the disease progresses the heart often becomes dilated, murmurs develop and sometimes decompensation with shortness of breath and cyanosis results.

Albuminuric retinitis is a serious complication which develops in prolonged cases of chronic nephritis and is due to the changes in the retinal blood vessels with hemorrhages.

Cardio Vascular Renal Disease

Cardio vascular renal disease is a combination of chronic nephritis and cardiac disease sometimes associated with arteriosclerosis.

This is the form in which most cases of chronic nephritis is usually seen, especially in hospital practice. The original cause may be the nephritis, the heart disease or the arteriosclerosis, but as each of these diseases progresses, changes occur in the other organs. For example, chronic nephritis is often complicated by high blood pressure, valvular disease and decompensa-

tion. Chronic valvular heart disease is often complicated by chronic nephritis. Arteriosclerosis is usually followed by chronic nephritis and heart disease.

Symptoms

As a rule the symptoms are a combination of symptoms of chronic nephritis, heart disease and arteriosclerosis, but the cases can frequently be divided into three groups according to the dominant symptoms, as follows:

1. Cardiac Type.
2. Renal Type.
3. Vascural and Hypertensive Type.

Cardiac Type: The symptoms of the cardiac type are principally symptoms of decompensation: shortness of breath, cyanosis and edema of the extremities. The patient also has symptoms of chronic nephritis and arteriosclerosis, which are not very marked.

Renal Type: The chief symptoms of the renal type are those of nephritis, edema, high blood pressure, headache and disturbance in kidney function. There are also symptoms of decompensation such as shortness of breath and cyanosis, which are not very marked.

Vascular and Hypertensive Type: The chief symptoms of this type are the symptoms of high blood pressure and arteriosclerosis: headache, sleeplessness, numbness in the extremities and sometimes various nervous symptoms. The patient may also have shortness of breath, pain over the heart area, evidence of chronic nephritis, and urinary changes.

Treatment of Chronic Nephritis

The treatment consists of preventive measures, proper hygiene, a suitable diet, and symptomatic treatment.

Prevention: Chronic nephritis may be prevented by early treatment of focal infections such as infected tonsils, teeth, or sinuses. Overfeeding and excessive use of alcohol and tobacco should be avoided. Protein foods and salts especially should be taken sparingly. A patient who has had acute nephritis should avoid exposure to cold or acute infections, to avoid recurrences.

Hygiene: The kidney function is often modified by temperature changes, consequently patients with chronic nephritis should wear woolen clothing during the winter and avoid exposure to

wet and cold. The patient should take frequent warm baths to stimulate excretion through the skin. The bowels should be moved frequently, preferably by saline purgatives. If possible the winter months should be spent in a warm climate.

Diet: The diet usually advised consists of moderate quantities of easily digestible foods and limitation of protein food. All condiments and alcoholic beverages should be avoided.

Symptomatic Treatment: The symptoms usually treated are edema, the uremic symptoms, the high blood pressure and the heart symptoms. When the symptoms are severe the patient is usually kept in bed. The principal symptoms; edema and uremia are treated in the same manner as in acute nephritis, see page 399. The high blood pressure and the headache, dizziness and other symptoms which it causes are treated by nitroglycerin or other nitrites, luminal, chloral and similar remedies. The cardiac symptoms and decompensation are treated by rest in bed, digitalis and other heart stimulants.

NEPHROSIS

Nephrosis is a disease of the kidney characterized by large quantities of albumin in the urine and edema, but without any evidence of retention of disturbed kidney function. It is sometimes considered as a form of chronic nephritis.

Cause: The cause of the disease is not definitely known. It may occur in the course of a chronic nephritis or develop in pregnancy. It sometimes occurs as a complication of syphilis or chronic tuberculosis. Some physicians believe it is caused by a disturbance of metabolism or deficient secretion of the thyroid gland.

Pathology: The disease process consists of degeneration of the tubules of the kidney with the formation of fat globules in them (fatty degeneration). As the disease progresses similar changes occur in the glomeruli. The kidney usually becomes large and white and is sometimes known as an amyloid or waxy kidney.

Symptoms

The chief symptoms are edema, large quantities of albumin in the urine and characteristic blood changes.

The edema begins with puffiness of the eyelids and face, or swelling of the ankles. It gradually extends all over the entire body. The daily urinary output is diminished, the urine has a very high specific gravity, sometimes as high as 1050, and it

contains large quantities of albumin. Sometimes the urine boils solid because it contains enormous quantities of albumin.

The blood changes are characteristic; the cholesterol (a phosphorized fat) in the blood is markedly increased. The total protein in the blood is diminished, and the globulin is increased while the albumin is diminished.

The kidney function tests show normal elimination of all waste products. The basal metabolism is usually diminished.

Treatment

Nephrosis is treated by causative methods, a special diet and by measures and remedies to relieve the edema.

Causative Treatment: The nephrosis of syphilis or tuberculosis is treated by the usual remedies commonly used in these diseases. Thyroid extract or thyroxin is given in large doses, especially when the basal metabolism is lowered, to accelerate metabolism.

Diet: Epstein's diet is commonly ordered. It is a high protein, fat-free and low carbohydrate diet containing 1200 to 2500 calories. Large quantities of protein are given to replace the proteins which are constantly eliminated through the urine. The diet usually consists of lean meats such as ham, veal or beef and various kinds of fish, without added salt, and a choice of split peas, lentils or mushrooms. In addition cereals such as oatmeal, shredded wheat, rice, and coffee, tea or cocoa are given.

Treatment of Edema: The edema is treated by eliminating salt from the diet and limiting the fluid to 1000 or 500 c.c. in 24 hours. If this is not effective hot packs and diuretics such as caffein, theobromine, sodium acetate, sodium citrate, salyrgin, euphyllin or novasurol are given in addition. Saline purgatives such as Epsom salt, Carlsbad salt, citrate of magnesia, Pluto water, etc., are also given to reduce the edema by producing frequent fluid bowel movements.

DISEASES OF THE URINARY TRACT

The Urinary Tract

The urinary tract consists of the ureters and bladder. The ureters are the excretory ducts of the kidneys. They begin in the ureter as a funnel-shaped sac called the pelvis and are continued as long narrow tubes to the bladder. The function of the ureters is to carry the urine excreted by the kidney to the bladder.

The bladder is a hollow muscular organ situated in the pelvis. It is capable of increasing in size according to its contents. The excretory duct of the bladder is the urethra. The function of the bladder is to act as a reservoir for urine.

Symptoms of Diseases of the Urinary Tract

The symptoms of diseases of the urinary tract are principally pain, disturbances in urination, hematuria and signs obtained by examination with the cystocope and X-ray.

Pain: The pain is usually an important and characteristic symptom. It is situated in the lumbar region or along the course of the ureter or in the bladder. Its character varies with the disease. Thus, in kidney stones it is very severe, sudden and excruciating, and radiates to the bladder. In other diseases of the kidney or urinary tract, it may be continuous or occur only on urination.

Disturbances in Urination: The disturbances in urination are often characteristic. The daily output may be increased or diminished. The urination is often frequent or painful. Sometimes large quantities of urine are passed periodically. Urination may stop suddenly and be followed by the passage of a large quantity of urine.

Hematuria: Blood in the urine is a characteristic symptom of many of the diseases of the urinary tract. It may appear as small clots which are passed with pain or as blood-tinged urine.

Urinary Changes: The changes in the urine in various diseases of the urinary tract are often characteristic. The urine may be cloudy and its reaction may be alkaline. It may contain pus, blood, crystals, stones or various bacteria.

Signs Obtained by the Physician: The physician is frequently able to recognize diseases of the urinary tract by finding tender areas in the region of the kidney or urinary tract or feeling a mass in the abdomen.

Instrumental Methods of Examination

The exact nature and extent of diseases of the urinary tract is usually determined by X-ray examination, cystoscopic examination, and pyelographic examination.

X-ray Examination: X-rays of the urinary tract are usually taken to determine whether stones are present because stones appear as faint shadows in the X-ray pictures.

The preparation for X-ray examination of the urinary tract is as follows: The night before the examination the patient is

given one or two ounces of castor oil about two hours after the evening meal. At 7 A.M. the following morning coffee and a roll is allowed for breakfast. At 8 A.M. and 10 A.M. a colon irrigation is given until gas and all the contents of the colon are expelled. The X-ray picture is then taken an hour or two later.

Cystoscopic Examination: Cystoscopic examination is a method of examining the urinary tract with a special instrument known as a cystoscope. This is an instrument which contains various lenses and a small electric light at its tip. By means of the cystoscope the physician is able to inspect the inside of the bladder and to probe the ureters. The examination is performed as follows:

The bladder is usually filled with a normal salt solution or some antiseptic solution to obliterate its folds so that its wall can be carefuly inspected. The physician is able to note ulcers or areas of inflammation in the bladder, whether the openings of the ureters are inflamed and the character of the urine which flows from each ureter. If there is an obstruction in a ureter, no urine flows from the obstructed side and the exact site of the obstruction is sometimes determined by passing a fine catheter into each ureter. The extent of the disease in each kidney and its function is often determined by examining a specimen of urine from each ureter.

Whenever it is necessary to operate for diseases of the urinary tract which also involve the kidney, the physician determines that the function of the unaffected kidney is normal. This is necessary because the diseased kidney is often removed and the remaining kidney has to perform the function of both.

Pyelographic Examination: This is a combined examination of the urinary tract with a cystoscope and X-ray. A cystoscope is inserted into the bladder and a fluid which produces a shadow in the X-ray pictures such as argyrol or bromide solution is slowly injected into the ureter, up into the pelvis of the kidney. The X-ray pictures of the urinary tract taken after the injection will show the exact course of the ureters, the site of an obstruction, a kink in the ureter, the size of the pelvis of the kidney, and the position of a stone.

Symptoms to be Observed by the Nurse

When nursing diseases of the urinary tract the nurse should observe and record the following symptoms:

1. The pain: its character, whether it is cramplike or dull, its location and the direction in which it radiates.

2. The urination: whether it is painful, frequent or intermittent, and the quantity of urine passed.
3. The character of the urine: whether it is cloudy, alkaline, or acid and whether it contains blood, pus, crystals or stones.

COMMON DISEASES OF THE URINARY TRACT

Diseases of the urinary tract may affect the ureters, the bladder, the kidney, or all these structures together. They occur in the following forms:

1. Malposition of the Kidney.
2. Kidney Stones.
3. Infections of the Urinary Tract and Kidney.
4. Tuberculosis of the Kidney and Urinary Tract.
5. New growths of the Kidney and Urinary Tract.

MALPOSITION OF THE KIDNEY

FLOATING OR MOVABLE KIDNEY

Floating or movable kidney is a displaced, low hanging or movable kidney.

Cause: The condition usually occurs in thin women and is merely one of the manifestations of visceroptosis, in which all the organs in the abdomen are displaced or hang low. It is also believed to be caused by tightly laced corsets, which displaces the kidney. The right kidney is usually affected.

Symptoms

In most cases there are no symptoms except occasional dull dragging pain in the back, especially on walking. Some patients get sudden characteristic attacks of severe abdominal pain called Dietl's Crisis. The patients usually complain of various nervous and gastric symptoms characteristic of their nervous temperament. The physician is usually able to feel the movable kidney through the abdominal wall.

Dietl's Crisis: This is an attack of severe abdominal pain caused by a sudden kink or twist of the ureter. The patient suddenly develops severe, excruciating pain in the region of the floating kidney and intense nausea and vomiting. The attack is sometimes followed by chills and fever. The secretion of

urine becomes markedly diminished or stops entirely. When the attack is over the patient usually passes large quantities of urine. During the attack the physician usually finds the kidney very large and tender.

Complications: Repeated attacks gradually develop a hydronephrosis or dilatation of the pelvis of the kidney.

Treatment

The object of treatment is to maintain the kidney in a normal position, to relieve attacks of Dietl's crisis and to relieve the associated nervous symptoms.

The kidney is often kept in a normal position and attacks of pain prevented by various abdominal belts, or strapping the abdomen with adhesive plaster.

During an attack of Dietl's crisis the patient should be put to bed at once and the foot of the bed should be elevated. A hot-water bag or an electric pad is applied over the affected kidney and hot drinks are given frequently. If the attacks occur repeatedly a surgical operation is performed to replace the kidney in a normal position. The operation consists of sewing the kidney to the back of the abdomen. The associated nervous and gastric symptoms are treated by overfeeding with milk, cream and other easily digested foods, by sedatives or by a rest cure.

RENAL CALCULUS OR KIDNEY STONES

Renal calculs, kidney stones or nephrolithiasis is a disease characterized by the formation of stones in the kidney or urinary tract.

Cause: The cause of stones in the kidney is not definitely known. Some physicians believe they are sometimes caused by a highly concentrated diet and not drinking enough water. Stones frequently develop in infections of the urinary tract around particles of pus or blood. The disease is more common in young persons and the tendency to form stones is frequently inherited. The disease is especially prevalent in England, Hungary and China.

Pathology: The urine contains a number of dissolved salts, principally phosphates and urates of sodium and potassium. When the urine becomes concentrated or contains excessive quantities of salts some of the salts form crystals or stones. The most common stones consist of calcium oxalate, uric acid or various phosphates.

Stones usually form in the pelvis of the kidney, where they may remain, and gradually increase in size until they fill the entire pelvis. Frequently, however, the pelvis of the kidney contains hundreds of tiny particles called gravel. The stones may remain in the pelvis or attempt to pass down the ureter. If the stones are small they pass through the ureter into the bladder. If they are too large they often block the ureter and produce symptoms. If stones remain in the urinary tract for a long time infections of the pelvis of the kidney, the ureter and bladder develop.

Symptoms

The principal symptoms are pain or attacks of kidney colic, disturbances in urination, characteristic urinary changes and X-ray and cystoscopic evidence of stones.

The pain may be a constant dull ache in the lumbar region or abdomen or sudden cramps often associated with fainting.

Renal Colic: The characteristic symptom of kidney stones is a typical attack of renal colic. The attack begins suddenly with a sharp excruciating pain in the region of the affected kidney which extends down toward the abdomen, the groin or into the bladder or genitals. The pain may last a few minutes or an hour or even longer and is accompanied by vomiting, excessive perspiration, rapid pulse, and collapse. It is sometimes followed by the passage of a large quantity of bloody urine or urinary tenesmus, a constant but ineffective desire to urinate. Sometimes the stone is passed in the urine. In severe cases the secretion of urine is suppressed.

The attack of renal colic is caused by the passage of a stone from the pelvis of the kidney through the ureter. If the stone is small enough, it passes into the bladder with slight pain or no pain at all. If it is too large it may obstruct the ureter and produce the characteristic attack.

Urinary Changes: The urination is often painful and frequent. Immediately after an attack the urine may contain blood and crystals. Between attacks the urine may be normal or contain albumin, crystals and sometimes pus.

The location of the stone is often determined by cystoscopic examination and X-ray and pyrlographic examination of the urinary tract.

Complications: The most common complications are infections and obstruction of the urinary tract. The most common infection of the urinary tract is pyonephrosis, an infection of the pelvis of the kidney. Sometimes the stone completely obstructs

the ureter. This often prevents the flow of urine from the affected kidney and causes hydronephrosis, a dilatation of its pelvis, which becomes filled with urine.

Treatment

The disease is treated by measures and remedies to relieve the attacks and prevent their recurrence, and by surgery.

Treatment of Renal Colic: The object of treatment is to relax the spasm of the ureter, to relieve the pain and allow the stone to pass.

A patient who has an attack of renal colic should be put to bed. A hot-water bag is usually applied over the region of the kidney and the patient is given hot drinks. A warm high colon irrigation is frequently given. If these measures do not relieve the pain, morphine or atropin is given hypodermically. When the patient passes urine the nurse should note the quantity, its character, whether it contains pus, blood, stones or crystals.

Treatment Between Attacks: When the attack is over the patient will usually have X-ray pictures and pyelograms taken and have a cystoscopic examination to determine the exact location of the stone. Between attacks of colic the patient is advised to drink large quantities of water or special waters such as piperazine water. Various urinary antiseptics are often given such as urotropin, caprokol and similar remedies for the associated infection of the urinary tract.

Surgical Treatment: If the stone is not passed it is usually removed by a surgical operation. In long-standing cases there is usually an associated severe infection of the kidney and urinary tract and the affected kidney may have to be removed.

HYDRONEPHROSIS

Hydronephrosis is a large dilated pelvis of the kidney which is usually filled with urine. The dilatation may be permanent or occur periodically.

Cause: Hydronephrosis is caused by an intermittent obstruction in the ureter. This occurs in floating or movable kidney when the ureter is frequently kinked and in renal stones when the ureter is repeatedly blocked by stones. It is more common in women than in men and in the right kidney more than the left.

Pathology: As a result of intermittent obstruction of the ureter the pelvis of the kidney gradually becomes dilated until it forms a large sac filled with urine.

Symptoms: The symptoms are the symptoms of the causative disease such as the movable kidney or stone, associated with pain and variation in the urinary quantity. The characteristic symptom is pain in the lumbar region, sudden diminution in urine and enlargement of the affected kidney. When the pain subsides the patient passes a large quantity of urine and the kidney becomes smaller. The urine is usually clear, of a low specific gravity, and shows no abnormal constituents except crystals or blood if the hydronephrosis is caused by stones.

Treatment: The treatment consists principally of removing or treating the cause, such as kidney stones or movable kidney.

In intermittent hydronephrosis when the pain is severe, the patient is kept in bed, warm applications are applied to the abdomen, and sedatives and atropine are given.

INFECTIONS OF THE KIDNEY AND URINARY TRACT

Infections of the kidney and urinary tract are diseases characterized by the formation of pus in the pelvis of the kidney, or abscesses within the kidney. The infections are caused by various bacteria, the colon bacillus, the streptococcus, and other bacteria. They may originate within the kidney or extend upward from the bladder. Sometimes the bacteria are carried to the kidney by the blood stream. Consequently the infections of the urinary tract and kidney are sometimes classified into two groups: (1) Ascending Infections; (2) Hemotogenous Infections.

Ascending infections are those which extend up from the bladder or the genital organs along the ureter to the kidney.

Hemotogenous infections are infections which are carried by the blood stream and lodge in the kidney, forming infarcts or abscesses.

Clinical Forms

The most common infections of the urinary tract and kidney are the following:

1. Pyelitis.
2. Pyelonephritis.
3. Pyonephrosis.
4. Perinephritis.

Pyelitis: Pyelitis is a pus-forming infection of the pelvis of the kidney. It occurs in an acute or chronic form.

Pyelonephritis: Pyelonephritis is an infection of the urinary

tract and kidney characterized by abscess formation in the part of the kidney which opens into the pelvis. The disease is merely an extension of a pyelitis into the kidney substance.

Pyonephrosis: Pyonephrosis is an infection of the kidney and its pelvis in which the entire kidney and pelvis is changed to a sac containing pus.

Cause: Acute pyelitis occasionally develops in typhoid fever and other infections and is caused by the excretion of bacteria through the kidney. It is especially common in children. Chronic pyelitis, pyelonephritis and pyonephrosis usually result from the infections associated with kidney stones or from obstruction in the course of the ureter. They sometimes develop from extension upward of an infection from the bladder, ureter and genital organs and occasionally in chronic nephritis.

Symptoms

The symptoms may be divided into four groups: local symptoms, fever, urinary changes and cystoscopic evidence of the infection.

Local Symptoms: The local symptoms are pain in the lumbar region or abdomen, painful and frequent urination and often the passage of large quantities of urine periodically.

Fever: Pyelitis is one of the most common causes of persistent fever. The temperature may be continuous, resembling typhoid, or it may be intermittent with chills and sweats, resembling septicemia or malaria. The fever may last for weeks and the patient may gradually become anemic and lose weight and strength.

Urinary Changes: The urinary changes are characteristic. The urine is alkaline and contains pus, numerous bacteria, and albumin.

Cystoscopic Signs: The cystoscopic examination will demonstrate pus flowing from the pelvis of the affected kidney. The pyelographic examination shows a large dilated pelvis of the kidney or causative stones.

Treatment

The acute cases of pyelitis should be kept in bed. The patient is given plenty of water, and various urinary antiseptics, such as caprokol, urotropin, acid sodium phosphate and similar remedies.

Chronic pyelitis, pyelonephritis and pyonephrosis are treated by urinary antiseptics and drinking large quantities of water. In severe cases the pelvis of the kidney is irrigated through a

cystoscope with various antiseptic solutions such as acriflavine, mercuroschrome and similar substances. If the pyelitis is due to a stone in the ureter the disease cannot be cured until the stones are removed by a surgical operation. In pyelonephritis the kidney is often so badly infected that it has to be removed.

Hematogenous Infections of the Kidney

Hematogenous infections of the kidney result when bacteria lodge in the kidney from the blood stream.

Cause: The disease usually occurs as a complication of bacteriemia or septicemia. It occasionally develops after an acute follicular tonsillitis. The mildest cases constitute a form of acute glomerular nephritis.

The disease process consists of the formation of an abscess or infarct on the outer part or cortex of the kidney. A large abscess is sometimes called carbuncle of the kidney.

Symptoms: The symptoms begin with a sudden pain in the lumbar region and a rise in temperature. The pain increases and the temperature becomes intermittent or septic in character and the leucocytes in the blood are increased. The urine contains blood, pus and albumin.

Treatment: The disease is treated like any case of septicemia or bacteriemia. The mild cases are treated like acute nephritis. When an abscess forms the patient is operated to open and drain the abscess.

Perinephritis

Perinephritis is an acute inflammation of the capsule of the kidney, which may result from an infarct or carbuncle of the kidney. The disease is characterized by the formation of a large abscess around the kidney.

The principal symptoms are pain and tenderness in the lumbar region and a marked rise in temperature.

The disease is treated by an operation to open the abscess and drain the pus.

TUBERCULOSIS OF THE KIDNEY AND URINARY TRACT

Tuberculosis of the kidney and urinary tract is a rare disease which usually occurs as a terminal infection in other forms of tuberculosis, such as pulmonary tuberculosis or tuberculosis in the urinary tract or genitals.

Pathology: The disease develops as a hematogenous or ascend-

ing infection. When it develops as a hematogenous infection small tubercles form on the outer part of the kidney and gradually the entire kidney becomes tuberculous. When it develops as an ascending infection the tuberculous process extends from the genital tract to the bladder, the ureter and kidney.

Symptoms: The chief symptoms are frequent and painful urination. The urine contains pus or blood and tubercle bacilli. The blood sometimes appears as small clots. Attacks of renal colic are sometimes produced by the passage of small clots of blood. There is usually marked loss in weight and strength and symptoms of tuberculosis in other parts of the body.

Treatment: The treatment is chiefly surgical, the tuberculous kidney and the infected ureter is removed and the patient is treated in the usual manner for tuberculosis, by overfeeding and fresh air.

TUMORS OF THE KIDNEY

The most commom form of tumor which occurs in the kidney is hypernephroma. Occasionally cancer, fibroma, adenoma or lipoma occurs.

Hypernephroma of the Kidney: Hypernephroma of the kidney is a tumor which originates in the adrenal gland or the kidney and gradually involves the entire kidney.

Symptoms: The symptoms are pain in the back, bloody urine and enlargement of the kidney. This is gradually followed by anemia, weakness and loss in weight.

The tumor is usually removed by a surgical operation

POLYCYSTIC KIDNEY

Polycystic kidney is a congenital disease characterized by development of numerous cysts throughout both kidneys.

The cause of the disease is unknown, but it usually occurs in children and occasionally in adults.

Symptoms: The principal symptoms are pain or a dragging sensation in the back, blood and albumin in urine and marked enlargement of the kidneys. If the disease is extensive it is usually fatal. In adults, if only one kidney is involved an operation is sometimes performed.

DISEASES OF THE BLADDER

The most common diease of the bladder is cystitis, but some-

times polyps and stones occur in the bladder. The exact nature of bladder disease is determined by cystoscopic examination.

CYSTITIS

Cystitis is an inflammatory disease of the bladder and occurs in an acute and chronic form.

Cause: Acute cystitis frequently occurs after a surgical operation or as a complication in acute infectious diseases such as typhoid fever.

Chronic cystitis develops in female patients when the bladder is prolapsed into the vagina, forming a cystocele. In male patients it usually results when the prostate is enlarged and the bladder is continually distended with urine. It also develops in old people and in various diseases of the nervous system as a result of weakened or paralyzed bladder muscles.

Symptoms: The symptoms are frequent, difficult and painful urination. The urine is cloudy, alkaline and contains pus and sometimes blood. In long standing cases some urine always remains in the bladder after urination. This is called residual urine and is usually obtained by catheterization.

The cystoscopic examination will usually demonstrate the inflamed or irritated wall of the bladder.

Treatment: Cystitis is treated by irrigating the bladder with weak antiseptic solutions of boric acid, acriflavine, argyrol, silver nitrate and similar substances. In addition various urinary antiseptics such as urotropin, caprokol and similar substances are given by mouth.

Other Diseases of the Bladder

Polyps and stones in the bladder sometimes occur. Polyps develop in the wall of the bladder and stones usually enter the bladder from the kidney or ureter.

The symptoms are frequent and painful urination. The urine usually contains blood or pus or both. The polyps or stones may be seen when the bladder is examined with the cystoscope. X-ray examination will also demonstrate stones.

The treatment is surgical, the polyp or stone is removed through special operating cystoscopes.

DISORDERS OF URINATION

Disturbances in urination are frequent symptoms in diseases

of the urinary tract and kidney. There are certain disorders of urination, however, which constitute a specific clinical condition.

Enuresis

Enuresis or bed wetting is a common condition in infancy and childhood. The child is unable to control urination, especially at night. The condition frequently occurs in normal children for a few years after they are taught to control urination. It is sometimes caused by diseases of the genital organs or nervous conditions. It is a common symptom in mentally defective children, in whom it may persist for many years.

Treatment: Bed wetting is treated by removing the cause and proper training. The child should not be allowed to take fluids at night and at supper time and should urinate before going to bed. If these measures are not effective small doses of atropine and similar remedies are given.

Incontinence of Urine

Incontinence of urine is a condition in which the patient is unable to control urination. As soon as the bladder becomes filled urine is passed. It is usually a symptom of diseases of the bladder, the prostate, or diseases of the nervous system, especially spinal cord diseases.

The condition is treated by relieving the cause and giving strychnine, tonics and similar remedies to improve the function of the nervous system and the muscles of the bladder.

Retention of Urine

Retention of urine is a condition characterized by accumulation of urine in the bladder. It usually results from obstruction of the urethra by a stricture or a large prostate. It also occurs in various nervous diseases when the bladder muscles are paralyzed.

The condition is treated by catheterizing and irrigating the bladder frequently to prevent cystitis and ascending infections of the urinary tract and kidney.

CHAPTER XXVIII

DISEASES OF METABOLISM

Metabolism

Metabolism is the process by which the body utilizes digested food and breaks down tissues into simpler substances. The process consists of two parts: anabolism and catabolism.

Anabolism or constructive metabolism is the process by which food is utilized as a source of energy and to repair or form tissue.

Catabolism or destructive metabolism is the process by which body tissues become disintegrated as a result of functional activity.

Foods

All food contains combinations of several of the following elementary food principles:

Carbohydrates.
Fats.
Proteins.
Mineral Salts.
Water.
Vitamines.

Carbohydrates: The carbohydrates are food principles which consist principally of carbon, oxygen and hydrogen. They may be divided into several groups, simple sugars, disaccharides or complex sugars, and polysaccharides or starches. Sugar, starches and potatoes are the best examples of carbohydrate foods. Breads, cereals, beans, carrots and liver contain large quantities of carbohydrates.

The process of digestion ultimately changes all carbohydrates to glucose, which is stored in the liver as glycogen. This is liberated into the blood and provides energy for muscular contraction and other activities of the body. When the glycogen is utilized it is changed to carbon dioxide and water.

Fats: The fats consist of carbon, hydrogen, and oxygen. The foods which consist of fat are butter, meat, fat, olive oil, cotton seed oil and cream. The fat is digested principally in the intes-

tine and finally enters the lymphatics in the blood stream. Fats are utilized in the body for the production of heat and energy. The fat which cannot be utilized for energy is deposited as characteristic layers throughout the body, under the skin, in the abdomen and in other parts of the body. In the process of metabolism the fats are changed to various complex acids known as fatty acids, which are subsequently completely oxidized to form carbon dioxide and water. In some diseases the fats are not completely oxidized and the acids remain in the blood and produce the condition known as acidosis.

Proteins: Proteins are compounds of nitrogen, carbon, hydrogen, oxygen and numerous other elements. The best examples of protein foods are meat, fish, the casein of milk, cheese, eggs, and similar foods.

Protein foods are digested in the stomach and intestines until they are changed to simpler substances known as amino acids. These are recombined and enter the blood to form the protein constituents of the serum, blood, tissues and organs of the body. The proteins are utilized to replace worn-out tissues and to form new tissue. In the process of metabolism part of the protein is changed to glucose, which is utilized to provide energy. The waste products which result from the metabolism of proteins are urea, uric acid, creatinin and purin substances.

Mineral Salts: Mineral salts are various inorganic salts which occur especially in vegetables, fruits, meat, milk, and other foods, usually as salts of calcium, potassium, magnesium and sodium. They are essential to life and are necessary for the growth of bone, for the proper function of the nervous system and for the function of other tissues and organs in the body. They are also necessary to retain fluid in the tissues.

When tissues contain an excess of salt they retain more fluid and edema results.

Water: Water occurs in nearly all foods and keeps the various salts dissolved. It is essential to life and normal function of all the cells in the body.

Vitamines: Vitamines are substances which occur in various foods. They are necessary for growth, nutrition, and the function of the nervous system. The nature of vitamines is unknown, but when they are absent in foods, characteristic symptoms result.

There are four kinds of vitamines: A, B, C, D and E.

Vitamine A is soluble in fat and occurs in animal fats such as cod-liver oil, butter, cream, milk, yolk of eggs, spinach and celery. When this vitamine is absent from the diet, xeroph-

thalmia develops. This is a dry ulcerated condition of the cornea of the eye which may cause blindness.

Vitamine B is soluble in water and occurs in the seeds of plants such as cereals, whole wheat, unpolished rice, peas and beans and in eggs of animals. It occurs abundantly in yeast. When this vitamine is absent from the diet a form of neuritis called beri beri develops.

Vitamine C is soluble in water and occurs in fresh fruits, especially oranges, lemons and tomatoes, in fresh leafy vegetables, liver and in germinated grains. When this vitamine is absent from the diet, scurvy develops.

Vitamine D is soluble in fat and occurs in cod-liver oil, butter and other fats. This develops in foods containing cholesterol as the result of the action of the ultra violet ray. When this vitamine is deficient in the diet, rickets develops.

Vitamine E occurs in meat, fat and in wheat. When this vitamine is absent from the diet pregnancy cannot occur and sterility results.

Calories: Energy is the ability to perform work, and since heat can produce energy, we measure the energy value of foods in terms of heat units or calories. A calory is the amount of heat necessary to raise the temperature of 1000 c.c. of water one degree Centigrade.

Caloric Value of Foods: The carbohydrates, fats and proteins of foods are capable of producing energy. The amount of energy which each of these food principles can develop is determined by burning them in a special apparatus known as a calorimeter. When they are metabolized in the body the same number of calories are produced as in the calorimeter. The energy value or caloric value of each food principle is as follows:

Carbohydrates: 1 gram produces 4 calories.
Fats: 1 gram produces 9 calories.
Proteins: 1 gram produces 4 calories.

The energy value of any food can be determined by finding the quantity of carbohydrate, fat and protein which it contains from standardized tables and then mutiplying each quantity by the caloric value of the various food principles.

Normal Food Requirements of the Body: The body needs food for the production of energy, for growth and for replacement of used tissues. The quantity of food and the number of calories necessary for normal function depends on the age, weight and sex of the person and the nature of their activity. A growing

child needs proportionately more calories than an adult, because growth requires a good deal of food. A powerful athletic man or a person who does hard physical work requires more food than a thin short woman or a person who is confined to bed.

It has been determined that an average normal person requires about thirty to forty calories of energy for every gram of body weight daily, while a person doing hard physical labor often requires as much as 60 calories per gram of body weight.

Normal Diet: An average diet for a normal person should contain a sufficient amount of carbohydrate and fat to provide energy, sufficient protein to replace tissue waste, and the necessary amount of salts, water and vitamines. As a rule a normal person doing physical work needs a diet containing 2500 calories. It should contain about ¾ to 1 gram of protein per kilogram of body weight and about twice as much carbohydrates as fat, but both in sufficient quantities to make up the necessary calories. In addition the diet should contain vitamines and roughage. If the patient is thin or short and leads a sedentary life, fewer calories are needed and the dietary requirements vary accordingly.

Basal Maintenance Diet: This is a diet which contains the number of calories necessary to maintain body function while the patient is resting quietly in bed. The number of calories required vary with the age, weight and height and are determined by special standard charts.

Symptoms of Diseases of Metabolism

The symptoms of dieases of metabolism vary according to the specific disease and according to the food principles which cannot be properly metabolized. We may therefore divide them into groups as follows:

Symptoms of Abnormal Carbohydrate Metabolism.
Symptoms of Abnormal Fat Metabolism.
Symptoms of Abnormal Protein Metabolism.
Symptoms of Abnormal Salt and Water Metabolism.

Symptoms of Abnormal Carbohydrate Metabolism: When carbohydrates cannot be properly metabolized the patient feels weak and tires easily. If the sugar content of the blood is increased, as in diabetes, the patient develops excessive thirst and passes excessive quantities of urine which contains sugar. If more carbohydrates are taken than the body can utilize, obesity often results.

Symptoms of Abnormal Fat Metabolism: The symptoms of

abnormal fat metabolism are loss or unusual gain in weight or obesity or an increase in cholesterol or other fatty substances in the blood. When the fats are not properly metabolized various organic acids form in the blood and produce acidosis. This is characterized by headache, drowsiness and coma and reduction in the alkaline reaction of the blood, and the presence of acetone and diacetic acid in the urine.

Symptoms of Abnormal Protein Metabolism: The symptoms of abnormal protein metabolism are the symptoms of gout and some of the symptoms of nephritis and nephrosis. They are usually retention of protein waste products in the blood or a change in the blood proteins. They are described with the special diseases.

Symptoms of Abnormal Salt and Water Metabolism: The symptoms of abnormal salt and water metabolism vary according to the disturbance. When the tissues contain an excess of salt, edema results. When there is a deficiency of calcium salts, the growth and ossification of bone is disturbed, or tetany, a condition characterized by muscular twitchings develops. The disturbances in water metabolism may cause excessive thirst, increased flow of urine and dryness of the skin. Sometimes severe toxic and nervous symptoms result from disturbed water metabolism.

Symptoms to be Observed by the Nurse

When nursing diseases of metabolism the nurse should observe and record the following symptoms:

1. The weight: whether the patient is losing or gaining in weight.
2. The intake of fluid.
3. The daily output of urine.
4. Edema: its extent and location.
5. In diabetes the nurse may have to examine the urine daily for sugar and acetone.

Dietary Treatment

Diseases of metabolism are treated principally by modifying the diet according to the specific disturbance of metabolism. The most common diets ordered are the following:

1. Diets from which foods which cannot be utilized are eliminated, such as low fat, low carbohydrates or low protein diets.

2. Diets containing an excess of food principles, fat, carbohydrate or vitamines, and excessive calories.
3. Calculated diets containing definite quantities of fats, carbohydrates and proteins.

The special diets will be described under the diseases in which they are commonly used.

Method of Preparing a Prescribed Diet: When the physician orders a diet for diabetes or other diseases of metabolism he frequently states the number of calories and the grams of protein, fat, carbohydrate and protein which the diet should contain for the entire day. In hospital practice the diet is usually prepared by the hospital dietician. In private practice it is sometimes necessary for the nurse to prepare a specified diet or to instruct the patient how to prepare it.

The diet is prepared as follows:

1. Divide the quantities of carbohydrates, fats and proteins into equal portions, according to the number of meals which are to be given during the day.
2. The quantities and kinds of food which will yield the required amounts of carbohydrates, fats and proteins are then determined from standard tables especially prepared for this purpose.
3. The necessary quantities of solid foods are then weighed on a standard Chatillon or similar scale.
4. The liquids are measured with measuring glasses graduated in pints or c.c.
5. Slices of bread are measured in inches.

The carbohydrates, fats and proteins should be contained principally in the foods and very little in dressings because many patients do not like certain dressings. The diet should also contain plenty of fresh vegetables without food value to provide bulk.

When the tray is returned all the food not eaten should be weighed and measured and subtracted from the quantities served.

DISEASES OF CARBOHYDRATE METABOLISM

DIABETES MELLITUS

Diabetes mellitus is a disease of metabolism characterized by the presence of sugar in the urine and an excessive amount of sugar in the blood.

Cause: The specific cause of the disease is unknown, but it frequently follows nervous shock, excitement, eating excessive quantities of carbohydrates, and obesity. Acute infections and chronic gall-bladder disease are probably frequent causes. The disease is frequently hereditary and is more prevalent in the Jewish race. Arteriosclerosis is probably a frequent cause of diabetes in old people.

Pathology: The disease process is principally a functional disturbance of the Islands of Langerhans of the pancreas. As a result the secretion of insulin is diminished and sugars and fats cannot be properly metabolized. As a rule, there are no structural changes in the pancreas, although chronic infections and degeneration of the Langerhans cells have been described. Arteriosclerosis of the blood vessels in the pancreas sometimes occurs in old persons.

Symptoms

The symptoms may be divided into three groups:

1. Clinical symptoms.
2. Urinary changes.
3. Disturbances in metabolism.

Clinical Symptoms: The disease usually begins gradually, but it occasionally develops suddenly after a nervous shock. The clinical symptoms are increased appetite, a craving for sweets, excessive thirst (polydipsia) and an increased secretion of urine (polyuria). Gradually other symptoms develop, loss in weight, itching of the skin and dryness of the mouth and tongue.

Urinary Changes: The daily output of urine is increased; sometimes to as much as 3000 to 4000 c.c. The urine is pale and has a high specific gravity, about 1030 to 1040, and contains **glucose or sugar,** frequently in large quantities. The sugar may be recorded in per cent or as the quantities eliminated in 24 hours. The total daily amount of sugar in the urine is determined by multiplying the quantity passed in 24 hours by the per cent of sugar which it contains. In severe cases the urine also contains acetone and diacetic acid.

Disturbances in Metabolism: As a result of deficient secretion of insulin the body is unable to utilize sugar, and in some cases fats as well. The sugar in the blood is increased in proportion to the severity of the disease. The normal quantity of sugar in the blood is 80 to 100 milligrams in a hundred c.c. of blood.

In diabetes the quantity is markedly increased, sometimes to as much as 300 to 400 milligrams. The inability to utilize sugar causes loss in weight and progressive weakness.

In severe cases the body is unable to burn up fat completely. As a result acidosis develops from accumulation of incompletely burned fatty acids in the blood which reduce its alkalinity. The excess of these acids is eliminated in the urine, forming acetone and diacetic acid. Acidosis is recognized by finding acetone and diacetic acid in the urine. The degree of acidosis is determined by measuring the quantity of carbon dioxide in the blood. The normal quantity is 55-77 volumes per hundred c.c. of blood serum. In acidosis this is markedly reduced. In severe cases of diabetes the fats in the blood are increased.

Clinical Forms: Diabetes is usually classified into mild and severe forms. We may also separate the cases into the following groups:

1. Diabetes in the Young.
2. Diabetes in the Obese.
3. Senile Diabetes.

Diabetes in the young is a severe, serious disease which occurs in high-strung, nervous boys and girls or in children. It may develop suddenly after a nervous shock and is frequently complicated by acidosis.

Diabetes frequently develops in obese persons from eating excessive quantities of carbohydrate food. It usually occurs in a mild form.

Senile diabetes is usually associated with arteriosclerosis. It occurs in a mild form and is easily controlled, but is frequently complicated by gangrene of the toes or foot.

Complications

The complications of diabetes are acidosis, diabetic coma, pruritus, gangrene, infections, tuberculosis and cataract.

Acidosis: Acidosis is the most serious complication of diabetes, and results when the body is unable to oxidize fats completely. It often develops when diets containing too much fat are given or when starvation treatment is used. It sometimes follows an operation, the administration of an anesthetic or an acute infection such as boils or pneumonia. It occurs in an acute or chronic form.

Acute acidosis develops suddenly with headache, drowsiness, nausea and vomiting, and a fruit-like odor of acetone to the

breath. Sometimes restlessness, twitchings and convulsions follow. The urine contains acetone, and in severe cases also diacetic acid. The carbon dioxide content of the blood is markedly reduced in proportion to the severity of the condition. As the acidosis increases the drowsiness changes to stupor and characteristic deep rapid breathing called Kussmaul breathing develops. Finally the patient goes into coma and dies.

Chronic acidosis is a mild form of acidosis characterized by fatigue, weakness, lack of energy and headache, associated with the presence of acetone in the urine and a reduction in the carbon dioxide content of the blood.

Pruritis: Pruritis or itching is a common symptom in diabetes. In some cases it is so severe and extensive that it may be considered a complication. It occurs especially on the vulva. The itching usually subsides when the diabetes is improved.

Gangrene: Gangrene is a complication of diabetes which is usually associated with arteriosclerosis. It occurs especially in old people and is probably due more to the arteriosclerosis than to the diabetes. Gangrene usually affects the toes, which become dry, blue and finally black. Gradually a line of demarcation forms at the junction of the dead toe with the normal tissue and the affected toe falls off. Sometimes the gangrene extends to other toes or the entire foot. When it is extensive erysipelas or bacteriemia may develop as a complication.

Infections: Diabetes is characterized by increased susceptibility to infections. Boils and carbuncles are common complications. They often spread rapidly, and may be followed by septicemia. Diabetic patients develop bed sores readily if they are confined to bed for a long time. Pulmonary tuberculosis frequently develops in the course of diabetes.

Any infection such as pneumonia or tonsillitis which develops in a diabetic patient is usually characterized by severe toxic symptoms.

The development of infections in the course of diabetes markedly increases the severity of the disease. For example, a patient may have diabetes with the urine containing about 1% of sugar, but when boils, pneumonia or other infections develop the percentage of sugar in the blood and urine is greatly increased and acidosis may develop.

Uncommon Complications: Cataract, neuralgic pains in the arms and legs, sciatica, and sometimes pains along the spine are other complications which sometimes develop in the course of diabetes.

Treatment

The treatment of diabetes may be divided as follows:

1. Prevention.
2. Hygiene.
3. Nursing care.
4. Dietary treatment.
5. Specific treatment with insulin.
6. Treatment of complications.

Prevention: It is important to regulate the diet and habits of persons who have an hereditary predisposition to diabetes. They should avoid excessive quantities of carbohydrate foods. They should choose an occupation free from nervous tension or worry of any kind and engage in all forms of athletic exercises.

Hygiene: Proper hygiene is an essential part of treatment and may prevent complications. The excretion of waste products should be stimulated by frequent warm baths and regular bowel movements. The patient should lead a calm quiet life free from excitement and worry. Moderate exercise is beneficial because muscular exercise helps to burn up sugar, but fatigue should be avoided.

Nursing Care: The nursing of a patient with diabetes is very important because the success or failure of treatment very often depends on it. A patient with severe diabetes or with acidosis should be confined to bed. The nurse should keep a special chart, on which she should record the following:

1. The protein, fat and carbohydrate content of the diet ordered for the day and the quantity of foods eaten.
2. The quantities of water, alcohol and other substances given during the day.
3. The total amount of urine passed in 24 hours.
4. The percentage of sugar which the daily urine contains, and the presence or absence of acetone and diacetic acid.
5. The sugar and carbon dioxide content of the blood.
6. The doses of insulin given and the time when they are administered.

In hospital practice the diet is usually prepared in a special diet kitchen and the trays are sent up already prepared, but each tray should be arranged attractively. After each meal the nurse should weigh each article of food which the patient does

not eat and subtract the amount from the quantities indicated on the daily menu sheet. The quantities of food actually eaten should then be recorded. In private practice the nurse may have to calculate and prepare menus herself. The method is described in books on dietetics and has already been briefly outlined.

She frequently has to instruct the patient in foods, caloric values, and the method of preparing a prescribed diet.

Dietary Treatment

Diabetes is treated principally by limiting the carbohydrates in the diet so as to eliminate the sugar in the urine and reduce the sugar in the blood. In some cases the reduction of the carbohydrate in the food will cause the sugar to disappear from the urine entirely. If there is acidosis the fats in the diet are also limited. The amount of carbohydrates which the patient can utilize, without showing sugar in the urine is called the carbohydrate tolerance. The quantity of fat which the patient can take without developing acidosis is the fat tolerance. Various physicians use different diets and the nurse should therefore become familiar with the most common diets used.

The diets used in diabetes may be divided into two groups: (1) test diets and (2) maintenance diets.

Test diets are diets used to determine the patient's tolerance for carbohydrates and fats.

Maintenance diets are diets used to keep the urine free from sugar and acetone and at the same time maintain nutrition.

Test Diets

The most common test diets are the Allen Diet and the Joslin Diet.

Allen Diet: This diet was most commonly used before insulin was discovered. The patient is kept on starvation for three or four days. Water a few drops of bouillon or black coffee or whisky is sometimes allowed. The urine is examined daily for sugar, acetone and diacetic acid. At the end of three days small quantities of carbohydrates are given, beginning with 5% vegetables. This is increased from day to day, and proteins and then fats are gradually added. The urine is examined daily for sugar, acetone and diacetic acid. As soon as the urine shows sugar no further changes are made in the diet. The quantities of carbohydrates, fats and proteins contained in the last diet, associated with a sugar-free urine, is the patient's dietary tolerance.

Some physicians modify this diet. Instead of beginning with

DIABETIC CHART

History No. 11559

Date	DIET IN GRAMS					Blood Sugar	Blood CO_2	Fluid Intake	24-HOUR URINE						Wght. Lbs.	TREATMENT	
	Prot.	Fat	Carb.	Alcohol	Calor.				Vol. cc.	Sugar %	Sugar Total	Acetone	Diac. A	Ammonia			
4/1/26						330	42.4	1200	1650	6%		Strong Positive	Pos.		131		
4/2/26	40	80	30		1010			600	1425	6%		not reported				Insulin U	xb.i.d.
4/3/26	40	80	30		1010			1200	1650			not reported				"	"
4/4/26	40	80	30		1010			600	1550	neg.		Pos.	neg.			"	"
4/5/26	40	80	30		1010			800	800	neg.		Pos.	neg.			"	"
4/6/26	40	80	30		1010			1280	700	neg.		Pos.	neg.		133	"	"
4/7/26	40	80	30		1010			1200	1375	neg.		Pos.	neg.			"	"
4/8/26	40	80	50		1080			1600	1325	neg.		Pos.	neg.			"	"
4/9/26	40	80	50		1080			1200	1250	neg.		Pos.	neg.			"	"
4/10/26	40	80	50		1080			1200	1150	neg.		Pos.	neg.			"	"
4/11/26	40	80	70		1160			1200	1100	neg.		trace	neg.			"	"
4/12/26	40	80	70		1160			1200	1450	neg.		trace	neg.		131	"	"
4/13/26	40	80	70		1160			1200	700	neg.		trace	neg.			"	"
4/14/26	60	90	80		1190			1400	1275	neg.		faint trace	neg.			"	"
4/15/26	60	100	100		1540	224	63.3	1200+	1500	neg.		neg.	neg.			"	"
4/16/26	60	100	100		1540			2000	1875	neg.		neg.	neg.			Insulin	Discont.
4/17/26	60	100	100		1540			2000	1850	3.9%		Pos.	trace			"	"
4/18/26	60	100	100		1540			1600	1975	4%		Pos.	neg.		129	"	"
4/19/26	60	120	100		1720			1800	1400	3.3%		Pos.	trace			Insulin	U xb.i.d.
4/20/26	60	120	100		1720			1400	1250	0.8%		trace	neg.			"	"
4/21/26	60	120	100		1720			1600	1525	0.4%		trace	neg.			"	"

three days of starvation they begin with small quantities of foods such as 10 grams of protein, 10 grams of carbohydrates and 20 grams of fats or other small quantities. The quantities are increased daily until the urine becomes sugar free.

Joslin Test Diets: These are special diets used to test the patient's carbohydrate tolerance and are given for four days. On the first day the diet contains carbohydrate 181 grams, fat 46 grams, and protein 46 grams. The quantities of carbohydrates and proteins are then reduced rapidly every day for three days until the urine becomes sugar free. The quantities of carbohydrates, fat and proteins contained in the diet which produce a sugar-free urine is the patient's dietary tolerance.

The following is the menu of the Joslin test diets:

First Day: 300 grams 5% vegetables.
2 medium-sized oranges.
3 shredded wheat biscuits.
4 uneeda biscuits.
2 medium-sized potatoes.
3 eggs.
120 grams 20% cream.

Second Day: 300 grams 5% vegetables.
2 medium-sized oranges.
1 shredded wheat biscuit.
2 uneeda biscuits.
1 potato.
3 eggs.
120 grams 20% cream.

Third Day: 300 grams 5% vegetables.
2 medium-sized oranges.
½ shredded wheat biscuit.
2 uneeda biscuits.
2 eggs.

Fourth Day: 300 grams 5% vegetables.
1½ medium-sized oranges.
120 grams 20% cream.
1 egg.

Maintenance Diets

Maintenance diets are diets which keep the urine free from sugar and acetone and at the same time maintain nutrition. Before prescribing a maintenance diet the physician determines the patient's dietary tolerance by the Joslin, Allen or other

methods. The following are the types of maintenance diets commonly used:

1. Basal Maintenance Diet.
2. High Fat Diet.
3. Low Fat Diet.

Basal Maintenance Diet: This is a diet which contains the number of calories which the patient requires while resting in bed. The number of calories varies with the age, weight and height of the patient and is usually determined from special tables or charts.

As a rule a patient requires 25 to 30 calories per kilogram or 2 1/5 pounds of body weight. The number of calories in the basal maintenance diet is therefore determined by multiplying the number of kilograms by 25 or 30.

The basal maintenance diets usually prescribed contain relatively high fats, about 2 grams per kilogram and about 2/3 or 1 gram of protein per kilogram. The rest of the calories are obtained from carbohydrates. If the urine remains free from sugar and there is no loss in weight this diet is maintained for weeks or longer. If, however, the urine still contains sugar, insulin is given. If the urine becomes free of sugar and the physician desires to increase the patient's weight, other articles of food are gradually added until the urine begins to show sugar. The patient is then kept on the last diet associated with a sugar-free urine. If, however, this is insufficient to maintain nutrition more food is added and insulin given.

High Fat Diets: Many physicians prescribe diets containing very large quantities of fats but the same number of calories contained in a basal maintenance diet. The large quantity of fat in the diet enables the body to utilize more carbohydrate and maintain nutrition because 1½ to 2½ grams of fat are oxidized in the body for every gram of carbohydrate.

The Newburgh and Marsh Diet is a diet which contains very large quantities of fat, low protein and low carbohydrates. The patient is kept on a diet containing 900 to 1000 calories made up of 90 grams of fat, 10 grams of protein and 14 grams of carbohydrate, for about two weeks. At the end of that time the diet is increased to 1400 calories by doubling the quantities of fats, carbohydrates and proteins.

Low Fat Diet: This is a diet which consists of sufficient quantities of proteins, carbohydrates and fats to provide the calories necessary to maintain nutrition, but the percentage of fat is relatively low.

The Joslin diet is a relatively low fat diet. After the patient's carbohydrate tolerance has been established by the test diets, various articles of foods low in fat are gradually added to provide enough calories to maintain nutrition. If this cannot be done without producing sugar in the urine, insulin is added.

Effect of Diet: Dietary treatment improves the patient's tolerance for carbohydrates. The low carbohydrate or low calory diets require little insulin and therefore conserve the function of the Islands of Langerhans of the pancreas.

When a patient has been kept on a maintenance diet for some time he is able to take larger quantities of carbohydrates than before, without showing sugar in the urine.

Dietary Variations for Special Symptoms

The standard maintenance diets frequently have to be modified to prevent loss in weight, in obesity, and in acidosis.

Loss in Weight: In some patients the maintenance diet which eliminates the sugar from the urine contains insufficient calories to maintain nutrition. To prevent loss in weight the physician usually orders more calories by adding fat or more food. If sugar appears in the urine as a result of the increase, insulin is added.

Obesity: The diet used in obese diabetics is usually relatively low in calories and fat because obese patients can provide energy by utilizing their own fat.

Acidosis: Acidosis sometimes results from an improperly balanced diet: a diet which contains too much fat or insufficient calories. The physician therefore modifies the diet in acidosis by reducing the fat or increasing the quantities of food.

Insulin Treatment

Insulin is a specific remedy for diabetes obtained from the Islands of Langherhans of the pancreas, which stimulates the utilization of sugar in the body. Its potency is measured in units; a unit being the amount of insulin which enables the body to utilize 2 to 2½ grams of sugar. It comes in ampoules marked U 20, U 40, U 80, which indicate the number of units contained in each c.c. It is given hypodermically about fifteen

minutes to a half hour before meals. The doses ordered depend on the quantity of sugar in the blood and urine.

Insulin is only used when the patient cannot be kept sugar free by diet alone or when the diet which eliminates sugar cannot maintain nutrition. The physician then prescribes a diet containing the necessary calories to maintain nutrition, and sufficient doses of insulin to utilize the extra carbohydrate and keep the urine sugar free. Insulin is also given in acidosis to enable the body to utilize fats completely.

Effect of Insulin: Insulin causes a prompt reduction in the sugar of the urine and blood and if sufficient doses are given the sugar disappears from the urine completely. The continued administration of insulin increases the patient's tolerance for carbohydrates and fats. Consequently many physicians reduce the doses of insulin gradually or leave it off entirely for a time. When sugar reappears in the urine insulin treatment is started again.

Insulin Shock: Insulin shock or hypoglycemic reaction is a condition which results when the blood sugar is reduced below the lowest normal limit and sometimes when it is reduced suddenly but not below normal.

The symptoms of insulin shock are nervousness, twitchings of the muscles, hunger, excessive perspiration and rapid pulse. They usually develop about two or three hours after an injection. In severe cases the patient may develop convulsions, delirium, collapse and coma.

The symptoms are promptly relieved by giving sugar in some form: orange juice, a lump of sugar or a piece of candy, syrup, honey or similar substances. It can also be relieved by a hypodermic injection of adrenalin. In severe cases glucose solution is given intravenously.

Treatment of Complications

Acidosis: Acidosis is one of the most serious complications of diabetes and before the advent of insulin it was frequently fatal. It is treated by diet, removing the cause and by insulin and other remedies.

Dietary treatment consists of reducing the fat in the diet when the acidosis is due to excessive fat, or increasing the quantities of food when it is due to relative starvation.

When patients cannot stand high fats without developing acidosis, some physicians prescribe intarvine fat, a form of fat which does not produce acidosis.

When the acidosis is due to infections it usually disappears when the infection subsides or is successfully treated.

The mild or chronic cases of acidosis are treated by a suitable change in diet, and by cathartics, such as castor oil, Epsom salt, citrate of magnesia or Pluto water. In addition colon irrigations are usually given daily. Some physicians order large doses of sodium bicarbonate by mouth or rectum. If these measures are not effective insulin is given.

The severe cases of acidosis should be put to bed. The patient should be watched carefully and intensive insulin treatment is started. The insulin is given in large doses, hypodermically. If the patient is drowsy or in coma the insulin is given intravenously. At the same time glucose solutions and large quantities of water or normal saline solution are given by a Murphy Drip or by mouth. The glucose is given to prevent insulin shock from the large doses of insulin necessary to relieve the acidosis.

As a rule during coma the physician does not try to keep the urine free from sugar, but attempts to relieve the acidosis and lower the carbon dioxide content of the blood and the acetone and diacetic acid in the urine.

In addition to insulin saline purgatives, colon irrigations and stimulants—digitalis, caffeine and similar remedies—are given.

Infections: Boils and carbuncles are usually treated surgically. Whenever any infection or infectious disease develops in diabetes the patient must be put on a diet which keeps the urine sugar free and the blood sugar low. This prevents acidosis and increases the patient's resistance.

Gangrene: The mild cases of gangrene will sometimes heal if the urine is kept sugar free by a suitable diet and insulin. When the gangrene is extensive the affected limb has to be amputated. To prevent acidosis and stimulate healing the patient is put on a suitable diet with or without insulin both before and after the operation.

APPROXIMATE PERCENTAGE OF CARBOHYDRATES IN VARIOUS FOODS

Vegetables (Fresh or Canned)

5%	10%	15%	20%
Lettuce	Onions	Green peas	Potato
Spinach	Carrots	Lima beans (canned)	Boiled rice
Asparagus	Squash	Artichokes	Shell beans
Egg plant	Beets	Parsnips	Baked beans
Cucumber	Mushrooms		Green corn
Tomatoes	Turnips		Boiled macaroni
Cabbage	Kohlrabi		
Beet greens	Pumpkin		
Celery			
Watercress			
String beans			
Broccoli			
Brussels sprouts			
Dandelion			
Swiss chard			
Sauerkraut			
Endive			
Rhubarb			
Marrow			
Sorrel			
Cauliflower			
Okra			
Sea kale			
Radishes			
Leeks			
Egg plant			

Reckon available carbohydrates in vegetables of 5% group as 3%—of 10% as 6%

Fruits

Grapefruit	Oranges	Apples	Plums
	Peaches	Pears	Prunes
	Pineapple	Apricots	Bananas
	Lemons	Raspberries	
	Watermelon	Blueberries	
	Strawberries	Huckleberries	
	Cranberries	Cherries	
	Blackberries	Currants	
	Gooseberries		

Nuts

Butternuts	Brazil nuts	Almonds	Peanuts
Pignolias	Black walnuts	English walnuts	
	Pecans	Pistachios	
	Filberts	Beechnuts	
	Hickory	Pinenuts	

FOOD VALUE OF COMMON FOODS

Food	Weight	Protein	Fat	Carbohydrate
Vegetables				
	Gms.	Gms.	Gms.	Gms.
String beans	120	1.	1.	2.
Lima beans	100	4.		15.
Peas	46	3.	1.	7.
Potato	50	2.		21.
Sweet potato	100	1.	1.	22.
Canned corn	100	3.	1.	19.
Carrots	100	1.		3.
Cabbage	100	1.		
Cauliflower	100	1.		3.
Onions	100	1.	2.	5.
Spinach	100	2.	4.	3.
Asparagus	125	2.		3.
Beets	70	2.		5.
Tomatoes	70	1.		3.
Squash	100	1.		4.
Turnips	140			1.
Lettuce	25			1.
Celery	55	1.		1.
Parsnips	50	1.		6.
Cucumber	100	1.		3.
Olives	36		7.	3.
Catsup	1 tablespoon			2.
Dairy Foods				
		Gms.	Gms.	Gms.
Milk	100 Gms.	3.3	4.	5.
Thin cream	2 tablespoons	1.	4.	1.
Whipped cream	2 tablespoons	1.	4.	1.
Skimmed milk	1 cup	7.	1.	11.
Cream cheese	50 Gms.	10.	13.	1.
American cheese	40 Gms.	11.	15.	2.
Butter	40 Gms.		34.	
Eggs	one	7.	6.	
Cereals and Bread				
		Gms.	Gms.	Gms.
Graham crackers	two	2.3	2.1	16.8
Macaroni, cooked	110 Gms.	3.3	1.6	17.3
Oatmeal, boiled	159 Gms.	4.4	0.8	18.2
Rice, boiled	87 Gms.	2.4	0.8	21.2
Spaghetti	28 Gms.	3.4	0.11	21.3
Zweiback	23 Gms.	2.2	2.3	16.9
Dressings				
		Gms.	Gms.	
Olive oil	2 tablespoons		26.	
Mayonnaise	1 tablespoon		20.	
Walnuts	five	4.	13.	3.

Meats

	Gms.	Gms.	Gms.	Gms.
Ham	100	22.	20.	
Lamb chops	100	22.	30.	
Steak	100	28.	8.	
Chopped beef	100	28.	8.	
Scraped beef	100	28.	8.	
Pork chops	140	36.	9.	
Chicken	100	32.	4.	2.
Bacon	30	3.	19.	

Fish

	Gms.	Gms.	Gms.	Gms.
Salmon	100	20.	10.	5.
Halibut	100	20.	4.	
Mackerel	105	28.	11.	
Sardines	100	23.	20.	
Smelts	190	30.	4.	1.
Oysters	6	5.	1.	3.
Codfish	100	22.		2.
Shrimp	100	25.	1.	

Fruits

	Gms.	Gms.		Gms
Orange	100	1		9.
Grapefruit	100	1.		15.
Pineapple	100			8.
Rhubarb	80			7.

Desserts

		Gms.	Gms.	Gms.
Diabetic custard (¼ egg and ¼ cup milk)		2.	4.	6.
Lemon jelly	1 cup	4.	1.	

DISORDERS OF FAT METABOLISM

OBESITY

Obesity is a disorder of metabolism characterized by excessive deposits of fat in the body. The fat may occur all over the body or be localized in certain regions. The disease occurs in two forms, according to the cause: acquired and constitutional obesity.

Acquired Obesity: Acquired obesity results from overeating, lack of exercise and a sedentary indoor life. It is also caused by a diet containing too much fat and carbohydrate food or by drinking alcoholic beverages, especially beer or ale, to excess.

Constitutional Obesity: Constitutional obesity is frequently hereditary or occurs as a symptom of diseases of the ductless glands, the pituitary, the ovaries and the thyroid gland. Hypopituitarism, especially the form called the Froelich syndrome, is characterized by obesity. Many women become stout at the menopause or after an operation for removal of the ovaries. Obesity sometimes occurs in deficient function of the thyroid gland.

Pathology: As a rule most of the fat is deposited under the skin, in the back of the abdomen and under the breasts. In severe cases it occurs in many of the organs, especially in the heart, liver, kidney and muscles.

Symptoms

The symptoms depend on the degree of obesity. The mild cases may have no symptoms except fatigue or excessive perspiration. The severe cases have a great craving for food, drowsiness, lack of energy, fatigue, frequent attacks of palpitation of the heart and shortness of breath.

The fat may be deposited in several ways; over the entire body, as a broad girdle over the upper part of the abdomen and back; as a large abdominal flap, or over the buttocks and lower extremities. Many physicians believe the distribution of the fat depends on the cause. Acquired obesity is generalized, the obesity in pituitary disease occurs principally on the upper part of the abdomen, as a broad girdle, while the obesity of the artificial or natural menopause is confined principally to the lower half of the body.

Associated Symptoms: The obesity caused by diseases of the ductless glands is associated with other symptoms of glandular deficiency. In obesity of pituitary disease the patient has typical headaches, scanty or absent menstruation and the characteristic appearance of the disease. Menopause obesity is associated with cessation of menstruation, hot flushes and nervous symptoms. The obesity of thyroid deficiency is associated with a slow pulse, drowsiness, dryness of the skin and a low basal metabolic rate.

Complications: The most common complications of obesity are diabetes, high blood pressure and decompensation of the heart.

Diabetes frequently follows obesity because overeating puts a strain on the insulin producing function of the pancreas. Sometimes the associated disorders of the ductless glands also produce disturbances in carbohydrate metabolism.

High blood pressure is sometimes a complication but as a rule the blood pressure in obesity is low.

Cardiac decompensation sometimes occurs as a result of the strain of the excess weight on the heart or in severe cases from fatty degeneration of the heart.

Treatment

Obesity is treated by preventive measures, diet, exercise and physical measures and by various remedies.

Prevention: Persons who have an hereditary tendency to obesity should avoid eating excessive quantities of carbohydrates and fats and should not drink excessive quantities of alcoholic liquors. They should take active exercise regularly and avoid sedentary habits.

Diet: The most effective method for reducing obesity is by a suitable diet. Many patients however do not coöperate with dietetic treatment because they cannot abstain from carbohydrates and fats for any length of time. Consequently the severe cases are best treated in a hospital where a prescribed diet containing weighed and measured quantities of various foods may be given. The patient should be under the care of a nurse especially trained in dietetics, and should put on a definite regime of diet exercise and various forms of physical therapy.

The most common diets used for obesity are the following:

1. Low Calory Diet.
2. Low Fat Diet.
3. High Protein Diet.
4. Vegetable Diet.
5. Milk Diet.

The Low Calory diet is a balanced diet which contains about 1200 calories or less, with limited quantities of carbohydrates, fat and water, but plenty of raw vegetables to make up bulk.

The Low Fat diet is a diet which contains sufficient calories to maintain nutrition, but the fats are limited.

The High Protein diet is a diet which contains excessive quantities of protein made up largely of meats and vegetables.

A vegetable diet is a diet containing principally vegetables and sufficient quantities of other foods to maintain nutrition.

The milk diet is the usual Karell diet consisting of 800 to 1000 c.c of milk. It is kept up for a week at a time while the patient is in bed.

Sequelæ of Dietetic Treatment: When a patient is kept on a

reducing diet too long various symptoms and sequelæ may develop such as weakness, headache, palpitation of the heart, nervousness and sometimes heart symptoms. Sometimes gall bladder colic or stones develop when a patient is reduced too rapidly.

Exercise: The object of exercise is to increase the utilization of fat. The patient is usually advised to take long walks or mild gymnastics or to play golf. Later tennis or other forms of strenuous exercise may be taken up.

When the patient is in bed, passive exercise, such as massage and passive movements are given.

Physical Treatment: Obesity is frequently treated by hot packs, electric cabinet baths and similar methods to produce perspiration and eliminate fluids. Colon irrigations are frequently given to increase elimination by the bowels.

Medicinal Treatment: The remedies commonly given for obesity are thyroid extract and other glandular substances and saline purgatives. Thyroid extract is usually given in large doses. It is indicated principally in the cases of obesity due to thyroid deficiency. When given in other forms of obesity it frequently produces toxic symptoms such as nervousness, palpitation of the heart, rapid pulse, etc. Pituitary extract is given for obesity due to pituitary disease. Menopause obesity is sometimes treated by large doses of ovarian extracts given by mouth or hypodermically. Saline purgatives such as magnesium sulphate, sodium sulphate, sodium phosphate and other salts are often given in large doses to eliminate fluid by the bowels.

LIPOMATOSIS OR LOCAL OBESITY

Lipomatosis or local obesity is a condition characterized by the formation of lumps of fat in various parts of the body. It occurs in two forms, fatty tumors and Dercum's Disease.

Fatty Tumors are large masses of fat which occur as small or large lumps on the back, shoulders or extremities.

Dercum's Disease is a disease characterized by the formation of small, painful lumps of fat on the arms, legs and trunk. It is associated with weakness, neuralgic pains and nervous symptoms. It is believed to be caused by diseases of the thyroid and pituitary glands.

ACIDOSIS

Acidosis is a reduction in the alkaline condition of the blood by excessive acid constituents.

Cause: The condition frequently develops as a complication of diabetes, nephritis and infectious diseases such as pneumonia, typhoid fever or cholera. It frequently results from starvation, especially in obese persons, from persistent vomiting or diarrhea, anaesthesia or poisons such as wood alcohol, carbon-monoxide, or other substances.

Symptoms

The symptoms of acidosis are headache, drowsiness, weakness, nausea and vomiting and a fruity odor to the breath. The urine contains acetone and diacetic acid and the carbon dioxide content of the blood is reduced. As the condition increases characteristic deep breathing called hyperpnea develops and the drowsiness changes to stupor. Finally the patient goes into coma and dies.

Treatment

Acidosis is treated by diet and various remedies according to its cause. In diabetes the dietary change consists of reducing the fat and increasing the quantity of food. In severe cases insulin is given together with glucose. In starvation the acidosis subsides when sufficient food is given. In nephritis the proteins are limited and carbohydrates are given. The acidosis of persistent vomiting or diarrhea subsides when these symptoms are relieved.

Remedies: Insulin and glucose are given in all forms of acidosis to increase utilization of fat and prevent the formation of acid substances in the blood. Many physicians order large doses of sodium bicarbonate by mouth, by rectum and in severe cases intravenously, to neutralize the excessive acid substances. The stomach is usually washed out and colon irrigations are given to eliminate causative poisons and acid substances. Large quantities of glucose solutions or normal salt solution are given by mouth, by rectum or intravenously.

ALKALOSIS

Alkalosis is an increased alkaline condition of the blood and other body fluids.

Cause: The condition usually results from giving excessive quantities of alkalies in the treatment of gastric and duodenal ulcer, or persistent vomiting or pyloric obstruction.

Symptoms: The symptoms are headache, nausea and vomit-

ing, twitching of the hands and face, and in severe cases the symptoms of tetany, characteristic twitchings of the hands, and sometimes convulsions.

Treatment: The disease is treated according to the cause. If it is due to excessive alkalies it disappears when they are stopped. Dilute hydrochloric acid is usually given by mouth. In severe cases an 0.8% solution of ammonium chloride is given intravenously.

DISEASES OF PROTEIN METABOLISM

GOUT

Gout is a disease of protein metabolism characterized by attacks of pain and swelling in some of the joints, especially the small joints of the upper and lower extremities.

Cause: The disease is caused by accumulation of uric acid in the blood and deposits of sodium urate crystals in the joints. It occurs in persons who eat excessive quantities of protein food, especially meat, and among those who habitually drink alcoholic beverages such as beer, ale or stout, to excess. It is frequently hereditary and is more prevalent in England. It is sometimes associated with lead poisoning and therefore occurs in typesetters, painters and similar occupations.

Symptoms

The principal symptom is a typical attack of acute pain in the small joints of the feet.

The attack usually occurs at night or in the early morning hours and consists of a severe sharp excruciating pain in the big toe. Sometimes the ankle or other joints in the foot may be involved. The pain subsides toward morning but the affected joint becomes red, painful and swollen. The attacks may recur for several nights and often with increasing severity. Gradually the other toes and joints are similarly affected.

Chronic Gout is a form of gout characterized chiefly by pain and stiffness in the small joints of the feet and hands. The affected joints gradually become thickened and deformed. In some cases characteristic whitish deposits of sodium urate crystals, called tophi, gradually form on the tips of the ears or around the joints of the fingers.

Complications: The most common complications are arteriosclerosis and chronic nephritis.

Treatment

Gout is treated by preventive measures, remedies to relieve the acute attack, a suitable diet and remedies to relieve the chronic joint affections.

Prevention: Persons who have an hereditary tendency to gout should avoid overeating, especially meats and other protein foods. They should abstain from alcoholic beverages and should engage actively in athletics.

Treatment of the Attack: A patient who develops an acute attack of gout should be kept in bed. The foot should be elevated on a pillow, wrapped in cotton or flannel and protected by a cradle because the slightest movement is painful. Various solutions are applied to the affected joints such as Burow's Solution, lead and opium wash, oil of wintergreen or similar substances. The patient is usually starved or put on a diet consisting of milk, cereals, toast and orange juice. The remedies usually given are atophan, wine of colchicum seeds or colchicin. If the pain is severe morphine or opium is ordered.

Diet: The diet consists principally of milk and vegetables in limited quantities. The foods commonly given are milk, cream, butter, cereals, bread, toast, fruits and cooked vegetables. The foods to be avoided are meats, sweetbreads, kidneys, fish, liver, peas, beans, celery and hearts of lettuce. The patient should drink large quantities of water to increase elimination of uric acid.

Treatment of Chronic Gout: Chronic gout is treated by diet, by stimulating excretion through the bowels and urine and by specific remedies.

The usual diet for gout is given and the patient's weight is kept down by limiting the quantity of food and moderate exercise. The bowels should be moved regularly by saline purgatives and the secretion of urine is stimulated by drinking large quantities of water.

Atophan is the specific remedy which often relieves the pain and swelling. The deformities of the joints are treated by baking, massage and passive mevoments.

DISORDERS OF WATER METABOLISM

DIABETES INSIPIDUS

Diabetes insipidus is a chronic disease characterized by secretion of enormous quantities of urine and an insatiable thirst.

Cause: The disease occurs especially in young people and is believed to be due to a disorder of the posterior lobe of the pituitary gland or the base of the brain near this gland. It sometimes follows a fracture of the base of the skull or meningitis in this region.

Symptoms

The chief symptoms are the passage of enormous quantities of urine and a corresponding enormous thirst. The daily output of urine may be 6000 to 10,000 c.c. The urine is pale, of low specific gravity and contains no abnormal constituents. The craving for water is uncontrollable and some patients drink gallons of water a day.

As a result of passing large quantities of urine, the skin becomes dry, perspiration is diminished and the patient becomes constipated. Insomnia often develops as a result of frequent urination at night.

Treatment: The disease is treated by a specific remedy, pituitrin, an extract made from the posterior lobe of the pituitary gland. It is given several times a day by hypodermic injection or by nasal spray.

CHAPTER XXIX

DEFICIENCY DISEASES

Deficiency diseases are diseases caused by continued use of diets deficient in various food principles. Deficient calcium and fat cause rickets and osteomalacia. Vitamine deficiency causes other diseases such as scurvy and beriberi.

RICKETS

Rickets is a food deficiency disease of infants and children characterized by deficient calcium in the bones and typical bony changes.

Cause: The disease is caused principally by deficient sunlight especially deficient ultra violet rays, and a diet containing insufficient fat and fat soluble vitamine D.

It occurs especially in bottle fed children who live in poor hygienic surroundings and are kept indoors, because the ultra violet rays cannot penetrate ordinary glass windows. Rapid growth is a predisposing factor.

Pathology: The disease process consists of softening of the bones especially at the epiphyses as a result of inability to utilize calcium and phosphorus. The bones of the legs, the ribs and the cranial bones are usually affected.

Symptoms

The symptoms develop gradually. The child becomes restless and irritable, especially at night, and perspires excessively on the head. Sometimes the child screams suddenly at night, a condition called night terrors. Gradually the typical symptoms develop: nodular thickening of the junction of the ribs and sternum (rachitic rosary), protrusion of the sternum (pigeon breast) and thickening of the wrist. The skull becomes large, the fontanelles do not close and teething is delayed. These symptoms are caused by faulty ossification at the epiphyses of the bones. As the disease progresses the abdomen becomes

prominent, "pot belly," the abdominal muscles become weak and bow legs or spinal curvature develops.

Complications: The severe cases are complicated by tetany, a condition characterized by twitching of muscles or convulsions. Rachitic children have a tendency to develop bronchitis or pneumonia readily.

Treatment

The treatment consists of prevention and specific treatment.

Rickets may be prevented by encouraging mothers to nurse their babies.

The specific remedies which can prevent and cure rickets are cod liver oil, yolk of egg and the ultra violet rays of the sun, or milk and other foods which are exposed to ultra violet rays. In the Summer, the children are exposed to direct sunlight and given foods exposed to ultra violet rays. In the Winter cod liver oil is given and ultra violet ray treatment by means of Alpine lamp, carbon lamp and similar forms of apparatus. In severe cases a wet nurse is obtained. The bow legs, curvature of the spine and other deformities which are common sequelæ of rickets are treated by various orthopedic measures.

SCURVY

Scurvy is a vitamine deficiency disease characterized by spongy bleeding gums, painful swollen joints, weakness and anemia.

Cause: The disease is caused by a diet deficient in vitamine C which is contained in fresh fruits and vegetables, liver, cereals and milk. It occurs in children when they are kept on artificial foods or on condensed, boiled or pasteurized milk for a long time. The disease was formerly prevalent among sailors on long voyages and inmates of institutions who lived on diets without fresh fruits or vegetables for a long time.

Symptoms

The symptoms occur in two forms: an adult form and an infantile form.

The adult form of scurvy begins with weakness and pains in the joints and a muddy color of the skin. This is followed by sore, bleeding spongy gums. In some cases hemorrhage from the stomach or bowels occur or hemorrhages into the joints and muscles. Repeated hemorrhages often produce anemia.

The infantile form is characterized by hemorrhages into the

joints. The knee, the hip or other joints become markedly swollen, painful and tender. The child cries when it is moved or touched, and gradually becomes weak and undernourished. Sometimes there is also bleeding of the gums.

Treatment

Scurvy may be prevented by including fresh fruits and vegetables such as oranges, lemons, tomatoes, potatoes, cabbage and fresh milk in the diet. The marine laws of most countries require all ships to include fresh fruits, especially oranges and lemons, in the diet.

The disease is cured by giving orange juice, lemon juice or other fruits and vegetables, and in children fresh milk in addition.

The bleeding gums are treated by astringent mouth washes. The affected joints are treated in the same manner as acute rheumatism, by rest and local application of various remedies.

BERIBERI

Beriberi is a vitamine deficiency disease characterized by pains along the course of the nerves, sometimes associated with edema.

Cause: The disease is caused by a diet deficient in Vitamine B, which is contained in the outer layers of cereals, in yeast, peas and beans and other green vegetables, and in milk and eggs. It is prevalent in China, Japan, and the Philippines as a result of eating polished rice.

Symptoms: The disease affects principally groups of nerves throughout the body and occurs in two forms; a dry form and a wet form. The dry form begins gradually with fatigue, indigestion and a heavy sensation in the legs. This is followed by pains and then loss of sensation in the arms and legs. As the disease progresses some of the muscles in the arms and legs become paralyzed. In the wet form the same symptoms occur but in addition edema of the legs and ascites develop. In severe cases palpitation of the heart, shortness of breath and other heart symptoms develop.

Treatment: The disease may be prevented and cured by a properly balanced diet containing unpolished rice, peas, vegetables, meat, eggs and milk; foods which contain sufficient vitamines. The paints are treated by sedatives and the paralysis by

massage and electricity. The heart symptoms are treated by digitalis and other heart stimulants.

PELLAGRA

Pellagra is a chronic endemic deficiency disease characterized by a seasonal occurrence of typical skin, gastrointestinal and nervous symptoms.

Cause: The disease is prevalent in the southern states, in Southern Europe, Italy, India and Central America.

The specific cause of the disease is unknown but it is believed to be due to a diet deficient in vitamines or other essential substances, to an infection, or to eating excessive quantities of spoiled corn.

Symptoms

The symptoms may last for years and recur every Spring or Autumn. The onset of the illness is usually preceded by fatigue, weakness, distention, slight diarrhea, depression, headache, dizziness and sleeplessness.

The chief symptoms are gastrointestinal disturbances and a typical rash. The gastrointestinal symptoms are a painful sore condition of the mouth and chronic diarrhea. The hydrochloric acid in the stomach is usually diminished and sometimes there is nausea and vomiting.

The rash resembles sunburn or eczema and usually occurs on the back of the hands; but it sometimes appears on other parts of the body, the neck, the face or the feet. It gradually becomes darker and finally peels, leaving a dull red parchment-like skin.

The nervous symptoms are headache, dizziness and sleeplessness and depression. As the disease progresses mental symptoms often develop, irritability, dullness, depression, melancholia or hallucinations, delirium and mental confusion. Many cases end with insanity.

Treatment

The disease is treated principally by a well balanced diet of meat, eggs, milk, fruits and vegetables.

When the diarrhea is severe the patient is kept in bed. The nursing consists principally of proper care of the mouth by antiseptic mouth washes and prevention of infection. The remedies commonly given are dilute hydrochloric acid and arsenic preparations such as Fowler's solution or arsphenamine. Transfusions are sometimes given in severe cases.

CHAPTER XXX

DISEASES OF THE DUCTLESS GLANDS

Physiology of the Ductless Glands

The ductless glands are a group of glands situated in different parts of the body, which secrete substances into the blood or lymph called hormones. They may be divided into two groups: ductless or endocrine glands and mixed glands.

Ductless Glands: The ductless or endocrine glands are the thyroid, the parathyroid, the adrenal, the pituitary, the thymus and pineal glands.

The thyroid gland is a large gland situated in the front part of the neck below the larynx. It surrounds the upper part of the trachea and is divided into two lateral lobes joined by a small isthmus.

The function of the thyroid gland is to control the rate of metabolism, and modify the function of the nervous system in the adult. In childhood it controls growth and development.

The parathyroid glands are four tiny glands imbedded within the thyroid gland. They control the metabolism of calcium salts and neutralize various poisons produced in the metabolism of proteins.

The adrenal glands are two large pyramidal glands situated above the kidneys. They consist of a cortex and medulla. The cortex controls the development of the sex organs. It becomes enlarged during pregnancy. The adrenal medulla secretes epinephrin or adrenalin. This contracts the small blood vessels, stimulates the sympathetic nervous system and probably increases the sugar in the blood. The secretion of epinephrin is increased during emotions.

The pituitary gland is a small gland about the size of a pea situated at the base of the brain in a small groove in the sphenoid bone called the sella turcica. It is divided into an anterior lobe and a posterior lobe. The function of the anterior lobe is to control growth of bone and the development of the genital organs.

The posterior lobe secretes a substance which contracts invol-

untary muscles of the uterus, the intestines, and other organs, and probably plays a role in fat metabolism.

The thymus gland is a gland situated in the chest which is present in childhood but gradually disappears when the genital organs develop and adult age is reached. Its function is probably associated with growth and development in childhood.

The pineal gland is a tiny glandular structure situated in the midbrain. Its function is probably associated with sex development.

Mixed Glands: The mixed glands are the pancreas, the ovaries and the testes. These are glands which have both an external and an internal secretion. The external secretion is poured into some hollow organ and the internal secretion is secreted into the blood stream.

The pancreas secretes pancreatic juice into the intestine for digestion of food. It secretes insulin into the blood stream to control the metabolism of sugar.

The ovaries secrete ova into the Fallopian tubes. They also secrete hormones into the blood stream which control the function of the breasts, the uterus, and the development of the secondary feminine physical and mental characteristics.

The testes have an external and internal secretion. The internal secretion controls the development of the secondary sex characteristics such as the growth of the beard, the physical build and other masculine physical and mental characteristics.

Glandular Interrelations: Some of the ductless glands stimulate or antagonize the function of others. Thus the thyroid gland and the adrenal medulla function together. The pituitary and the gential organs act together.

Symptoms of Ductless Glands Diseases

Diseases of the ductless glands produce local and general symptoms.

Local Symptoms: The local symptoms are enlargement of the gland and symptoms of pressure on neighboring structures. The enlargement of the thyroid gland is usually apparent or can readily be made out by feeling the gland. The enlargement of the pituitary gland is determined by X Ray examination of the sella turcica, the groove at the base of the skull where it is situated.

The pressure symptoms vary with the location of the gland. An enlarged thyroid gland causes a choking sensation or difficulty in breathing. An enlarged pituitary gland may cause a

form of headache and blindness by pressure on the optic nerves. An enlarged thymus gland sometimes causes shortness of breath and coughing spells.

General Symptoms: The general symptoms depend on the gland affected and the nature of the disturbance. They are the symptoms of disturbed metabolism, abnormal growth and development and sometimes circulatory symptoms.

The symptoms of disturbed metabolism are obesity or loss in weight, change in the rate of metabolism and in carbohydrate tolerance.

The symptoms of abnormal growth and development are variations in stature or excessive or diminished growth of the bones and soft tissues and faulty development of sex characteristics.

The symptoms of disturbances in the heart and vascular system are a rapid or slow pulse, flushing of the face, pallor, etc., and changes in blood pressure.

The symptoms of disturbances in the nervous system are tremors, sleeplessness, emotional upsets, and sometimes characteristic muscular twitchings.

In some diseases of the ductless glands the symptoms which result from disturbed function of the affected glands are typical: For example, menstrual disturbances and faulty genital development are characteristic symptoms of diseases of the ovaries.

Special Methods of Examination

There are a number of special methods of examination used to determine disturbances in the function of the ductless glands or changes in their size. They are chiefly the basal metabolism test, the sugar tolerance test and X Ray examination.

Basal Metabolism Test: The basal metabolism is the rate of metabolism of a person while at rest. It is controlled principally by the thyroid gland and is increased when the function of the thyroid is excessive, and diminished when its activity is lowered. Consequently disturbances in the function of the thyroid gland are often determined by means of an apparatus which measures the patient's rate of metabolism.

The basal metabolism test is done in the morning while the patient is without breakfast. After a preliminary rest of a half hour the test is performed by one of the following methods: the gas analysis or the oxygen method.

The gas analysis method consists of allowing the patient to breathe fresh air through a special apparatus and collecting

the expired air in a special tank. A sample of this air is then analyzed for its content of oxygen and carbon dioxide. The basal metabolism rate is then determined by a special method of calculation.

The oxygen method consists of allowing the patient to breathe pure oxygen while at rest and measuring the time it takes to consume a definite quantity of oxygen. The basal metabolism rate is then determined on a chart or by special methods of calculation.

Sugar Tolerance Test: This is a test to determine the rate of elimination of a definite amount of sugar or glucose and is performed as follows:

1. The night before the test the patient is given a light supper, and only water is allowed during the night. No breakfast is given the day of the test.
2. At 8 A.M. a specimen of blood is taken from an arm vein in a tube containing calcium oxalte, and a specimen of urine is obtained.
3. The patient is then given 120 Grams of syrupy glucose dissolved in hot tea or coffee, and the time when this is administered should be noted.
4. A specimen of blood and urine is then obtained 45 minutes and another 2 hours after the glucose is given.
5. The urine and blood specimens should be sent to the laboratory and labeled as follows:

Before glucose
45 minutes after
2 hours after

X Ray Examination: The size of the pituitary gland is often determined by an X Ray of the skull and the size of the thymus gland by an X Ray of the chest.

Symptoms to be Observed by the Nurse

When nursing diseases of the ductless glands the nurse should observe and record the following symptoms:

1. The weight; taken at frequent intervals to determine a gain or loss.
2. The pulse; the rate and character.
3. Vascular symptoms such as hot flushes or pallor.
4. Nervous symptoms: tremors, emotional upsets, drowsiness and various mental symptoms.
5. The character and associated symptoms of menstruation.

Diseases of the Thyroid Gland

The diseases of the thyroid gland are usually characterized by enlargement of the gland which is called goiter. This may be the only symptom or it may be associated with symptoms indicating excessive function of the gland, hyperthyroidism, or diminished function of the gland, hypothyroidism. We may therefore classify diseases of the thyroid gland as follows:

1. Goiter
2. Adolescent Goiter
3. Goiter with Hyperthyroidism
4. Diseases associated with Hypothyroidism

GOITER

Goiter is an enlargement of the thyroid gland. It occurs in two forms: Endemic Goiter and Sporadic Goiter.

Endemic goiter is a form of enlargement of the thyroid gland which occurs in certain localities. It occurs especially in mountainous or inland countries such as Switzerland and some of the middle western states of the United States, especially in Ohio, Minnesota and Illinois.

Sporadic goiter is a form of goiter which occurs in regions where the disease is not prevalent.

Goiter is sometimes described according to the structural changes in the gland as adenomatous, colloid or cystic goiter. Adenomatous goiter consists of nodular masses made up of the same structural elements as a normal thyroid. Colloid goiter is a goiter in which the glandular elements are distended with colloid, a substance which occurs in the thyroid gland. Cystic goiter is a large cyst which occurs in the thyroid gland.

Cause: The disease is believed to be due to a deficiency of iodine in drinking water and is especially common in women.

Symptoms

The chief symptom is enlargement of the thyroid gland. The patient usually complains only of the unsightly appearance of the neck but sometimes pressure on neighboring structures causes shortness of breath, hoarseness, or a tight sensation in the neck. As a rule the entire gland is enlarged but sometimes the goiter consists of one or several nodes or a large lump or cyst in the gland. The basal metabolism rate is usually normal.

Treatment

Endemic goiter may be prevented by continued administration of various iodine salts. Consequently iodine preparations are given regularly to children and adults in goiter districts in the form of a table salt, chocolate or a solution containing sodium iodide.

Goiter is also treated by thyroid extract, thyroxin and sometimes by small doses of iodine in the form of Lugol's solution. If the goiter is large it is usually removed by a surgical operation.

Adolescent Goiter

Adolescent goiter or puberty hyperplasia of the thyroid is a form of thyroid enlargement which occurs in young girls 13 to 20 years of age at the time when they begin to menstruate.

Symptoms: The chief symptom is a soft enlargement of the thyroid gland often associated with irregular menstruation. Sometimes nervous symptoms develop, especially at the menstrual periods.

The condition is treated by small doses of thyroid extract.

Goiter with Hyperthyroidism

The enlargement of the thyroid gland associated with evidence of over activity of the thyroid gland occurs in three forms:

1. Exophthalmic Goiter
2. Toxic Adenoma
3. Hyperthyroidism

Exophthalmic Goiter

Exophthalmic goiter is a disease characterized by enlargement of the thyroid gland, rapid heart action, increased basal metabolic rate, loss in weight, and exophthalmos. The disease is also called Graves' Disease, Basedow's Disease or Parry's Disease.

Cause: The specific cause of the disease is unknown. It occurs especially in young women, between the ages of 20 and 30, who have a characteristic constitutional nervous temperament. The disease sometimes develops after a nervous or mental shock.

Symptoms

The chief symptoms are rapid heart action, loss in weight, nervousness, intense weakness, an increase in the basal metabolic rate, exophthalmos and tremor of the hands.

The disease begins gradually but sometimes suddenly after an emotional shock, with progressive weakness, nervousness, sleeplessness, palpitation of the heart, excessive perspiration and loss in weight.

As the disease progresses the typical symptoms develop. The patient is restless and apprehensive. The pulse is very rapid and bounding, about 140 to 160 or more and the blood pressure is increased. The face and chest are flushed, the skin is moist and oily, becomes very red when it is stroked. The thyroid gland is enlarged, but it is soft. The eyelids are widely separated, producing a staring expression and gradually exophthalmos or protrusion of the eyeballs develops. The nervous symptoms are characteristic tremors of the hands, irritability, abnormal fears and emotional upsets such as crying spells, and sometimes mental excitation or delirium. The patient loses steadily in weight and gets extremely weak. In some cases nervous indigestion with pains in the stomach and vomiting develops.

The most important and diagnostic symptom of the disease is the increase in the basal metabolism rate. This is markedly increased, usually to the extent of plus 50 or plus 75, or more.

Complications: The most common complications are glycosuria and cardiac complications, which often develop in severe cases.

Treatment

The disease is treated medically or surgically.

Medical treatment consists of complete mental and physical rest, overfeeding and the use of various remedies. The patient should be kept in bed, preferably in a separate room in quiet, pleasant surroundings. The nursing care is especially important. The nurse should be sympathetic and kind. She should go out of her way to please the patients because they are oversensitive and often develop intense emotional reactions on the slightest provocation. Excitement of any form should be avoided. It is very essential to make the patient gain in weight by rest and overfeeding. Consequently a high fat and carbohydrate diet is ordered, although all kinds of nourishing and appetizing foods may be given.

The remedies used are sedatives, such as luminal or bromides, and quinine hydrobromide or suprarenal extract. Iodine is frequently given in small doses in the form of Lugol's solution usually preliminary to an operation. X Ray treatment is frequently used.

The surgical treatment consists of tying the main arteries of

the thyroid gland or removing part of the gland to lessen its function.

Toxic Adenoma

Toxic adenoma is a disease of the thyroid gland characterized by symptoms of overactivity of the gland.

Cause: The disease is more common in women around the age of forty, and occurs especially in patients who have had a goiter for a long time. It sometimes follows pregnancy or focal infections.

Symptoms: The symptoms develop gradually and are principally nervousness, palpitation of the heart, rapid heart action, weakness and loss in weight. The thyroid gland is usually enlarged but the goiter involves only part of the gland and sometimes consists of a number of nodules. The metabolic rate is usually only moderately increased.

The disease is similar to exophthalmic goiter but it occurs in older persons, the symptoms are mild and there isn't the typical nervous excitation or exophthalmos.

Treatment: The treatment is usually surgical and consists of removing a part of the thyroid gland. Medical treatment, similar to that used for exophthalmic goiter, is sometimes tried.

Hyperthyroidism

Hyperthyroidism is a condition characterized by symptoms of overactivity of the thyroid gland. It is probably a mild form of exophthalmic goiter or toxic adenoma.

The symptoms are nervousness, restlessness, sleeplessness, irritability, rapid pulse rate, flushing of the skin, and loss in weight. The essential and diagnostic symptom is the increase in the basal metabolic rate. As a rule the thyroid gland is enlarged, but it may be situated under the sternum. Sometimes the gland is normal in size.

Thyrocardiacs are patients who have a small unrecognized goiter for years which produces irregular and rapid heart action and ultimately decompensation of the heart. The condition is treated like exophthalmic goiter or hyperthyroidism.

DISEASES OF THE THYROID GLAND ASSOCIATED WITH HYPOTHYROIDISM

The diseases of the thyroid gland associated with diminished function of the gland occur in two forms:

1. Myxedema
2. Cretinism

MYXEDEMA

Myxedema is a disease characterized by symptoms indicating deficient function of the thyroid gland.

Cause: The disease may result when too much thyroid gland is removed in a goiter operation or after too intensive or prolonged X ray treatment. It sometimes occurs in women around the age of 45 or 50, at the menopause, without any apparent cause. This form is probably due to a gradual atrophy of the gland incident to advancing years. It occasionally develops from infections of the thyroid gland and in colloid goiter.

Symptoms

The patient gradually develops physical and mental sluggishness and steadily increases in weight. The movements, speech and mental processes become slow and deliberate and the patient often becomes drowsy. As the disease progresses the skin becomes cold, dry, scaly and puffy. The hair is dry and the eyebrows and eyelashes fall out and the nails are brittle. The pulse is slow and weak, the pulse is often subnormal, anemia develops and the urine contains albumin. The joints often become swollen and in women menstrual disturbances especially amenorrhea occur.

The essential and diagnostic symptom is a marked reduction in the basal metabolic rate which in severe cases is as low as minus 30%.

Treatment

The disease can be definitely cured by sufficient doses of thyroid extract given by mouth. In severe cases the active principle of the thyroid gland, thyroxin, is given by mouth or by injection into the veins.

The effect of treatment is remarkable. All the symptoms of the dlisease disappear when sufficiently large doses of thyroid extract or thyroxin are given continuously.

CRETINISM

Cretinism is a disease of infants or children due to deficient function of the thyroid gland characterized by retarded physical and mental development.

Cause: The disease is congenital and occurs especially among the children of parents who have endemic goiter in goiter regions.

It is believed to be due to iodine deficiency in the mother. The thyroid gland may be absent or rudimentary.

Symptoms

The symptoms usually only become apparent when the child is about a year or two old. The child does not grow and develop but remains short and stunted. Teething, walking and talking are delayed. The growth of the bones is markedly delayed because the epiphyses do not unite with the shaft. All mental processes are markedly retarded and the child remains dull and stupid. The appearance of the child is characteristic. The skin is dry and scaly and the hair is coarse; the face and eyelids are puffy and the nose is flattened. The lips are thickened and the tongue is swollen and protrudes from the mouth and there is drooling of saliva. The child has a dull blank expression with a peculiar grin.

Treatment

The disease may be prevented by giving iodine to endemic goiter patients during pregnancy.

The disease can be cured by giving thyroid extract in sufficiently large doses. The best results are obtained when the treatment is begun at an early age. It must be continued throughout the patient's life.

DISEASES OF THE PARATHYROID GLANDS

TETANY

Tetany is a disease of the parathyroid glands characterized by peculiar contractions of the muscles especially of the arms and hands.

Cause: The disease results when the parathyroid glands are removed together with the thyroid in a goiter operation. It also occurs in children suffering from rickets. It occasionally develops during pregnancy or after infections.

Symptoms

The characteristic symptoms are sudden spasms or contractions of the flexor muscles of both arms and forearms. As a result the arms are bent on the body and the forearms and hands are bent inward with a peculiar contraction of the fingers. In some cases similar spasms occur in the legs and in other muscles of the body. As a rule the attacks last several hours

and in mild cases they are brought on only by mechanical or electrical irritation. The calcium content of the blood is usually lowered.

Gastric tetany is a form of tetany in which the patient gets spasms in the stomach due to sudden contraction of its muscles.

Objective Signs: The physician often recognizes tetany by producing spasms in various ways. Trousseau's sign consists of producing a spasm by applying pressure on the arm with a tight bandage.

Chvostek's sign consists of producing a spasm of the facial muscles by tapping the facial nerve in front of the ear. Pool's sign consists of producing a spasm of the arm muscles by extending the arm, and a spasm of the leg by extending the leg.

Erb's sign is a change in the irritability of the nerves to a galvanic electric current.

Treatment

Tetany is treated by giving parathyroid extract by mouth or parathormone hypodermically and calcium preparations by mouth or intravenously. In addition a low protein diet containing large quantities of vitamines and fluids are given. Colon irrigations and saline purgatives are also given to eliminate putrefactive material from the intestines. Alpine light treatment is often used because the ultra violet rays stimulate utilization of calcium.

DISEASES OF THE ADRENAL GLANDS

ADDISON'S DISEASE

Addison's disease is a rare fatal disease of the adrenal glands characterized by intense weakness, low blood pressure and pigmentation.

Cause: The disease is usually due to extensive tuberculosis of the adrenal glands and occasionally to cancer.

Symptoms

The symptoms begin with intense weakness and fatigue. This steadily increases and is followed by pigmentation of the skin and mucous membranes. Numerous irregular shaped brownish or gray patches appear on the hands, neck, in the groin, axilla or on the abdomen or back. Similar spots develop in the mucous membrane of the mouth, on the gums and the inner part of the

cheeks. The pulse is slow and weak and the blood pressure is very low. The temperature is subnormal and the blood sugar is markedly reduced. The patient usually suffers from various symptoms of indigestion, pain, fullness, distention, constipation or diarrhea and sometimes vomiting.

As the disease progresses the weakness becomes extreme and the patient lies in bed, dull, apathetic, completely devoid of initiative or energy.

Treatment

The disease is treated by hypodermic injection of epinephrine or adrenalin and large doses of suprarenal extract by mouth. In addition strychnine and arsenic are given and a diet of simple nourishing foods.

Adrenal Insufficiency

Adrenal insufficiency is a condition which often follows acute infections or physical and mental strain. The symptoms are weakness, exhaustion, loss of energy, rapid pulse, low blood pressure and subnormal temperature. The condition is usually treated by rest, strychnine, caffeine, adrenalin and various tonics.

DISEASES OF THE PITUITARY GLAND

The most common diseases of the pituitary gland occur in several forms as follows:

1. Pituitary Tumor
2. Hyperpituitarism or Acromegaly
3. Hypopituitarism of Froelich Syndrome
4. Diabetes Insipidus

PITUITARY TUMOR

Pituitary tumor is a new growth which develops from the pituitary gland. It sometimes grows into the gland from neighboring structures.

The symptoms may be divided into three groups:

1. Pressure Symptoms
2. Glandular Symptoms
3. X Ray signs

The pressure systoms are severe boring headaches in the temples and often projectile vomiting. This is associated with the symptoms by which the physician recognizes the disease, a

peculiar form of partial blindness called bitemporal hemianopsia. The patient cannot see objects on the outer half of each visual field but the vision on the inner half of the field is normal. This is caused by pressure on the optic chiasm, or crossing of the optic nerves, which is situated just in front of the pituitary gland. In some cases transient blindness or various forms of progressive blindness or blindness in one eye occurs as a result of a choked disc. Sometimes paralysis of eye muscles occur which cause strabismus.

The X Ray of the skull will often show a large and eroded sella turcica, the bony groove where the pituitary gland is situated.

The glandular symptoms are usually enlargement of the hands, feet, skull and the structures of the face. In some cases, obesity and amenorrhea (cessation of menstruation) develop.

Treatment

The disease is treated by a surgical operation to relieve the blindness. X Ray and radium treatments are also given.

HYPERPITUITARISM OR ACROMEGALY

Hyperpituitarism or acromegaly is a disease of the pituitary gland characterized by enlargement of the hands and feet.

Cause: The disease is caused by overactivity of the anterior lobe of the pituitary gland and sometimes by a tumor of the gland.

Symptoms

The principal symptoms are progressive enlargement of the hands, feet, skull and structures of the face. The patient often has pains in the feet and hands and a characteristic headache in the temples or above the eyes. In women menstruation often stops.

As the disease progresses the appearance of the patient becomes typical. The hands and feet are large and broad, the skull is large, the cheeks and bony ridges above the eyes are prominent, the nose and lips are large and thick, the lower jaw protrudes, the teeth are separated, the tongue is thick and the voice is low and hoarse.

X Ray examination of the skull usually shows enlargement of the sella turcica as a result of the enlarged pituitary gland.

Gigantism is a form of hyperpituitarism which begins in child-

hood. It is characterized by increase in stature as a result of excessive growth of the leg bones.

Treatment

The disease is treated by X Ray and radium and by pituitary or thyroid extract. If it is due to a tumor the treatment is surgical.

HYPOPITUITARISM

Hypopituitarism or Froelich syndrome is a disease of the pituitary gland characterized by deficient development of the genital organs and a typical obesity.

Cause: The disease is often congenital or results from infections, injuries to the base of the skull or a tumor. It is more common in children and women.

Symptoms

The principal symptoms are faulty development of the genital organs and a typical obesity.

The genital organs may develop slowly or remain infantile. As a result puberty is delayed and secondary sex characteristics do not develop normally.

In males the growth of beard is retarded or absent and the breasts are large, the skin is smooth and the pelvis is broad. In women the breasts are small, there is often a tendency for hair to grow on the face and other parts of the body and the pelvis is small. The menstruation may begin late or stop entirely. It may occur at long intervals and in small or variable quantities. The patients usually have characteristic headaches in the temple or above the eyes, especially before or after menstruation, which are often associated with abdominal cramps and disturbances of vision. Sometimes difficulties arise during labor as a result of the small pelvis. The severe cases are often sterile.

The obesity is typical and occurs around the abdomen and back, in the form of a broad girdle and is called girdle adiposity.

Treatment

The disease is treated by pituitary extracts given in large doses. The obesity is best treated by diet and the usual reducing methods.

Other Forms of Hypopituitarism

There are a number of other forms of hypopituitarism such as Diabetes insipidus, Lorrain-Levi type and combined forms.

Diabetes Insipidus: This is a disease of the pituitary gland or of structures at the base of the brain in the same region. It is characterized by the passage of enormous quantities of urine containing no abnormal constituents, and an insatiable thirst. It is treated by injections of pituitrin. It is described with diseases of metabolism.

Lorrain-Levi Form: This is a form of hypopituitarism characterized by faulty genital development and persistence of infantile characteristics but without adiposity.

Combined Forms: These are forms of disease of the pituitary gland characterized by some symptoms of deficient function and other symptoms of increased function of the gland. Acromegaly may occur with obesity and menstrual disturbances resulting from genital insufficiency. Diabetes insipidus may be associated with acromegaly or the Froelich syndrome.

Disorders of Ovarian Function

Disorders of ovarian function occur in two forms: excessive function and diminished function.

Excessive ovarian function produces a condition called precocious puberty. This is characterized by early onset of menstruation, sometimes at the age of five or six, associated with precocious development of the breasts and other secondary sex characteristics.

Diminished ovarian function is characterized by late onset of menstruation, faulty development of the genital organs and secondary sex characteristics, and menstrual disturbances, chiefly diminished or absent menstruation.

In medical practice, however, disturbances of ovarian function occur principally in two forms: menopause syndromes and menstrual disorders.

Menopause Syndromes

Menopause syndromes are groups of symptoms which result from a natural or artificial menopause. The natural menopause occurs around the age of fifty, but the exact age varies in different women. The artificial menopause may occur at any age and results when both ovaries are removed by an operation. The condition is caused by deficient or absent internal secretion of the ovaries.

Symptoms

The chief symptom is cessation of menstruation which is usually associated with one of the following conditions:

1. Vascular Symptoms
2. Menopause Hypertension
3. Menopause Neurosis
4. Menopause Psychosis

Vascular symptoms are usually described as hot flushes. The patient develops sudden attacks of flushing of the face, sometimes alternating with pallor, and often associated with excessive perspiration, headache and various pains and aches.

Menopause hypertension is an increase in blood pressure which occurs at the time of the natural menopause without any other apparent cause. The patient complains of headache and the usual symptoms of high blood pressure.

Menopause neurosis is a group of nervous symptoms consisting chiefly of crying spells, irritability, sleeplessness, palpitation of the heart and weakness which occur at the natural or artificial menopause.

Menopause psychosis is a group of mental symptoms which sometimes develop at the natural menopause. They occur in two forms, a maniacal and a depressive form. The maniacal form is characterized by excitation, delirium, incessant talking and delusions. The depressive form is characterized by depression and melancholia.

Treatment

The menopause syndromes are usually treated by ovarian extracts or corpus luteum preparations because the symptoms are due to deficient secretion of the ovaries. They are given by hypodermic injection or by mouth. Some physicians add other glandular substances such as thyroid, pituitary and suprarenal extracts if the patient also symptoms of deficient function of these glands.

Disorders of Menstruation

The disturbances in menstruation consist of amenorrhoea, menorrhagia and metrorrhagia.

Amenorrhoea is cessation or absence of menstruation.

Menorrhagia is excessive bleeding at the menstrual periods.

Metrorrhagia is bleeding between menstrual periods.

Dysmenorrhea is painful menstruation.

Cause: Menstrual disturbances are caused by disturbance in function of the ovaries as a result of organic disease of the ovaries and tubes, or faulty development of the ovaries. They are also caused by diseases of other ductless glands, or other

diseases such as anemia, tuberculosis, neurosis or to a change in climate.

Symptoms: The menstrual disturbance is often associated with evidence of the causative condition such as organic disease of the ovaries, tubes or uterus, faulty genital development, thyroid, pituitary or adrenal disease, tuberculosis, anemia, etc. Various forms of menstrual disturbance may occur in the same disease. Thus exophthalmic goiter may be associated with dysmenorrhea or amenorrhoea. Pituitary disease may be associated with amenorrhea or menorrhagia.

Treatment

The menstrual disturbances are treated by various gynecological procedures, organic and other remedies according to the cause. Thyroid extract is given if there is evidence of thyroid deficiency, pituitary extract in pituitary cases and ovarian extract or corpus luteum when there is ovarian deficiency. If anemia or a neurosis is the cause the menstrual disturbance improves when these conditions are successfully treated. Dysmenorrhea is often treated symptomatically by sedatives, pyramidon, aspirin, luminal and similar remedies to relieve the pain.

DISEASES OF THE THYMUS GLAND

STATUS THYMOLYMPHATIUS

Status Thymolymphatius is a disease characterized by enlargement of the thymus gland. It occurs in infancy and childhood and is probably congenital.

Symptoms: The typical symptoms are sudden attacks of severe asthma during the first two years of life. They are caused by pressure of the large thymus gland on the trachea. The child usually has a typical delicate smooth skin and pink complexion and is very susceptible to infections and develops acidosis readily. The large thymus gland is usually recognized by an X ray picture of the chest.

Sometimes cyanosis and sudden death occur after a tonsil or other operation, the administration of an anesthetic or a hypodermic injection.

If the child survives the first few years of life it may develop the asthenic constitution characterized by fatigue, low blood pressure and muscular weakness.

Treatment: The disease is treated by X Ray applications

over the sternum to reduce the size of the gland. Some physicians give small doses of atropine or potassium iodide. A child with a large thymus gland should not be operated upon or be exposed to other shocks. The symptoms in older children are treated by glandular substances such as pituitary or suprarenal extracts.

Diseases of the Pineal Gland

Tumor of the pineal gland sometimes develops in children.

The symptoms are those of pressure in the region of the brain where the impulses for the pupillary muscles originate (the corpora quadrigemina) associated with other symptoms of brain tumor; headache and blindness. A characteristic pupillary symptom is temporary dilatation of one pupil or a permanently dilated pupil. In boys the brain symptoms are associated with precocious development of the sex organs and precocious physical and mental development.

The disease is treated principally by X Ray and radium, but it is usually of no avail as the disease is fatal.

Pineal extract is an extract made of the pineal gland which is sometimes given to mental defectives because it is believed that mental deficiency is associated with deficient functions of the pineal gland.

CHAPTER XXXI

DISEASES OF THE JOINTS, BONES AND MUSCLES

DISEASES OF THE JOINTS

The diseases of the joints are usually inflammatory in nature and may be divided into acute arthritis and chronic arthritis. Acute arthritis usually occurs in rheumatic fever, gout or as a complication of bacteriemia and has already been described.

CHRONIC ARTHRITIS

Chronic arthritis is a chronic inflammatory disease of the joints.

Cause: The most common cause of chronic arthritis is a focus of infection from which bacteria or other poisons are constantly absorbed. The infection may be in the tonsils, the sinuses, the teeth, the intestines, the gall bladder, the prostate or in other organs. Exposure to wet and cold, old age, overeating and excessive quantities of protein food are probably predisposing factors.

Pathology: The disease process is a slow progressive chronic inflammation of the joint structures which results in the formation of scar tissue. The process gradually destroys the cartilage of the joint surfaces of the bones. This is replaced by new thickened cartilage or by bony growths around the edges of the bones. As a result the affected joints become stiff and sometimes completely immovable. The disease may affect one joint, especially the knee, or several joints throughout the body.

Symptoms

The disease develops gradually with pain and stiffness in the affected joints. The pain occurs especially when the joint is moved, and often there is pain along the course of a neighboring nerve. For example, in chronic arthritis of the hip the patient may have pain along the sciatic nerve. At times the affected joints become acutely inflamed and filled with fluid.

As the disease progresses the joints become swollen, the tissues around the joint become thickened and bony growths develop at the edges of the bones which markedly limit their motion. X Ray pictures of the affected joints show the thickened structures and often bony growths around the edges of the bones.

Special Forms of Chronic Arthritis

Chronic Productive Osteoarthritis

Chronic productive osteoarthritis is a form of progressive chronic arthritis which occurs in young adults and causes permanent stiffness and deformity of many of the joints in the body. The disease is also called Arthritis Deformans or Rheumatoid Arthritis.

Symptoms

The disease often begins suddenly with an acute painful inflammation and swelling of several joints, associated with fever. The attack subsides in six to eight weeks or longer leaving the joints stiff and the muscles around them weak and atrophic from weeks of disuse. The hands, feet, knees, elbows, ankles, the maxillary joints or the cervical spine are usually involved. As the disease progresses attacks recur at frequent intervals and after each attack the stiffness increases and the muscles of the extremities are weakened.

Sometimes the disease begins gradually with neuralgic pains, numbness, tingling and fatigue, followed by stiffness of the joints and gradual atrophy of the muscles.

In the course of time permanent deformities develop in many of the joints, the arms and knees become flexed, the hands and fingers are turned outward, the jaw becomes stiff, and the patient becomes a helpless bed ridden invalid.

Spondylitis Deformans: This is a chronic arthritis of the spine characterized by stiffening of the spine and bony growths along the edges of the affected vertebræ. The chief symptoms are pain and stiffness of the back. The X Ray shows the bony growths.

Charcot's Joint: This is a chronic disease of the joints which occurs in locomotor ataxia or syringomyelia. It is characterized by a painless swelling of the joints, which become filled with fluid.

Menopause Arthritis: This is a form of arthritis which occurs in women at the menopause especially when they are stout. It is characterized by pain in the knee, shoulder or hip.

Treatment

Chronic arthritis is treated by removing focal infections, by diet, physical treatment, climate and by various remedies.

The removal of focal infections in the tonsils or teeth is usually followed by prompt improvement in the symptoms of the arthritis unless extensive bony changes have already developed.

Dietary treatment consists of limiting the total calories and reducing the carbohydrates and proteins in the diet. If the patient is obese and at the menopause reducing diets are often used. Acidophilus milk is often added to the diet to check the growth of intestinal bacteria.

Physical treatment is given in various forms: baking, diathermy, salt baths, massage and passive motion. Sometimes various splints are applied to immobilize the joint and relieve pain.

Many patents are benefited by a warm climate or by taking a cure at various springs, such as Hot Springs of Virginia or Arkansas and similar places.

The remedies usually given are atophan, salicylates, potassium iodide, arsenic, thyroid extract and aolan or sterile milk injections. Local applications of liniments, oil of wintergreen and similar substances are sometimes advised.

In severe cases typhoid vaccine is given intravenously to produce a severe chill and fever (shock treatment) and thereby to relieve the pain and stiffness.

DISEASES OF THE MUSCLES

Muscular Rheumatism

Muscular rheumatism, myalgia or myositis is an inflammation of the muscle sheaths or tendons characterized by pains in the affected muscles.

Cause: The disease is caused by exposure to wet and cold, by injury or strain or sitting in a draught.

Symptoms

The characteristic symptom is a dull or sharp cramplike pain in the affected muscles lasting several days. The disease commonly occurs in three forms: wry neck, lumbago and pleurodynia.

Wry neck or torticollis is a form of myalgia affecting the muscles of the neck. The muscles in the affected side are painful and tender and the neck is held rigid to avoid pain.

Lumbago is a painful condition of the muscles of the back. The pain is especially marked on bending or turning.

Pleurodynia is a painful condition of the muscles of the chest.

Treatment

The disease is treated by various forms of heat such as diathermy or baking. Salicylates or coal tar remedies are given to relieve the pain. Pleurodynia or lumbago is sometimes treated by strapping with adhesive plaster.

DISEASES OF THE BONES

Diseases of the bones other than fractures and tuberculosis are rare. They are usually characterized by excessive bone formation or thickening, by disturbances in the growth of bone or by softening of bone. Osteitis deformans is a disease characterized by bony thickening. Achondroplasia is a disturbance of bony growth and osteomalacia is a disease characterized by softening of the bones.

Osteitis Deformans

Osteitis Deformans or Paget's disease is a chronic disease of the bones characterized by thickening of the skull, and curvature of the spine.

The cause of the disease is unknown but it occurs late in life and is usually associated with arteriosclerosis.

The symptoms begin with pains in the joints or legs. Gradually the head becomes large and thickened, the spine becomes markedly curved and rigid, and the legs are bent outward. As a result the patient becomes a short hunchback with a characteristic posture; the head is convex and is bent forward, with the chin almost touching the chest.

Achondroplasia

Achondroplasia or Chondrodystrophy is a congenital disease caused by arrested ossification of the bones of the fetus. As a result growth of the long bones is checked and the patient remains a dwarf with a characteristic large head, normal trunk and short bowed extremities. The condition is not amenable to treatment.

Osteomalacia

Osteomalacia is a disease characterized by softening of the bones and inability to calcify bone.

The disease occurs only in women as a result of undernourishment, poor hygiene and frequent and numerous pregnancies.

The symptoms are pains in the bones, tremors and cramps in the muscles. Gradually a shuffling gait, deformities and fractures of the bones develop. Finally the patient is unable to walk and becomes a bedridden invalid. The calcium in the blood is increased and the X Ray of the bones shows typical changes.

The disease is treated by cod liver oil and a high calcium diet consisting of meat, eggs, milk and vegetables. The patient should avoid pregnancy.

CHAPTER XXXII

DISEASES OF THE NERVOUS SYSTEM

Physiology of the Nervous System

The nervous system is an organized group of structures and organs which regulate and coördinate the functions of all the other organs of the body.

All the structures of the nervous system are made up of round, oval or pyramidal specialized cells called neurons. The cell body of the neuron is extended as fine threadlike processes called axones and dendrites. Axones are very thin threadlike processes which may be a few millimeters or several feet long. The dendrites are short branching processes which are usually much shorter than the axones. The function of the axone is to transmit impulses while that of the dendrite is to receive impulses. Nerve tissue is called gray matter when it consists principally of cells, which give it a pinkish gray color. It is called white matter when it consists principally of axones or dendrites which give it a pinkish white appearance.

The organs which constitute the nervous system are the brain, the medulla and the spinal cord and the nerves.

The Brain: The brain is situated in the skull and is the largest organ of the nervous system. It consists of the cerebrum which is the largest part of the brain, the cerebellum or hind brain and the medulla oblongata.

The cerebrum is divided into two hemispheres by a longitudinal slit or fissure. The outer part of the cerebrum is called the cortex and consists principally of nerve cells, hence it consists of gray matter. It is divided by numerous fissures or slits into irregular shaped folds or convolutions which are named according to the bones of the skull under which they lie, as follows: frontal, parietal, temporal, occipital convolutions, etc. When several convolutions occur in the same region they are numbered from above downward. In this way the location of any convolution may be described. Some of the areas of the brain are named to indicate their function, such as the speech center, the motor area, the visual center, etc.

The inner part of the brain consists principally of numerous white fibers extending in all directions. Some of the fibers pass downward to the spinal cord, others up to the cortex or to various nuclei within the brain. Association fibers are fibers which extend from areas of gray matter in the cortex to other areas on the same or opposite side of the brain. The corpus callosum is a broad brand of association fibers which joins both hemispheres of the brain. There are also several small areas of gray matter called nuclei situated within the white matter between bands of fibers.

Function of the Cerebrum: The function of the cerebrum may be divided into three parts as follows:

1. Motor Function
2. Sensory Function
3. Mental Function

The motor function consists of sending impulses from the cortex of the brain or from the nuclei within, to the various organs of the body. These impulses cause coördinated and other contractions of various groups of muscles; that is, contractions to perform a definite function as walking, talking, etc. The area of the brain which sends impulses for movements of the upper and lower extremities is definitely known and is situated in front of the fissure of Rolando. The fibers from the cells in this area converge to form a band of fibers known as the internal capsule. When they reach the beginning of the spinal cord the fibers cross to the opposite side. They then extend into the spinal cord and constitute some of its motor tracts.

The speech center is an area of gray matter where the impulses for speech originate. It is situated in a part of the frontal convolution called Broca's area, so named because it was originally described by Broca, a French surgeon. It is situated only on the left side except in left-handed persons, in whom the location is reversed.

Sensory Function: The sensory function of the brain consists of receiving sensations from the skin and organs of special senses and registering them in various areas of the cortex of the brain. These impulses reach the brain directly by nerves or indirectly through the spinal cord.

The sensations may be divided into two groups:

1. Special senses, such as sight, hearing, smell and taste.
2. General sensations received from the skin: the sense of touch, heat, cold, pain and muscular sense.

The areas in the brain where the various sensations are received are definitely known. Visual sensations are registered in the occipital lobe of the brain. The sense of hearing registers its impressions in the temporal lobe, the sense of smell at the base of the brain. The sensations from the skin and mucous membranes are registered near the motor areas.

Mental Function: Every impulse received in the brain through the various sensations, or the motor impulses sent out from the brain is registered in the brain and can often be recalled as a memory.

The mental function of the brain consists of correlating the impressions received in the brain or the memories stored into some definite mental process. It is beyond the scope of this book to discuss these processes at length. The familiar mental processes are attention, memory, reasoning, judgment, emotions, imagination and will power.

The Cerebellum: The cerebellum or hind brain is much smaller than the cerebrum and is situated in the back and lower part of the skull. It is attached to the cerebrum and the medulla by bands of fibers known as peduncles. The surface of the cerebellum consists of gray matter which is arranged in numerous parallel folds. Its inner part consists of tracts of fibers and several small areas of gray matter.

The function of the cerebellum is principally to control the equilibrium of the body and coördination of muscular contractions. Disturbance in the function of the cerebellum results in staggering and muscular incoördination.

Nerve Tracts: The nerve fibers through which the brain sends or receives its impulses are arranged in definite bundles or tracts. They usually follow a definite course in the brain or spinal cord. Some nerve tracts extend all the way from the brain to the spinal cord while others are short tracts which end in nuclei or centers of gray matter. When a tract ends in a nucleus its impulses are then relayed by other tracts.

The physician is often able to determine the exact location of organic diseases of the brain and spinal cord by a knowledge of the function and location of the various centers in the gray matter and the course of the various tracts. If a disease affects a specific center it interferes with its function and produces characteristic symptoms. If a motor area is involved, paralysis results. If the visual area is affected disturbances in visual impressions result. Diseases which affect particular tracts of

fibers interfere with their ability to transmit or receive impulses and characteristic symptoms result.

Cranial Nerves: The cranial nerves are twelve pairs of nerves, which transmit impulses from the special senses directly to the brain, or motor impulses from the brain to various muscles of the face, tongue and other structures. They may be divided into motor, sensory and mixed or special nerves.

The sensory nerves are the first, second and eighth nerves. The first nerve transmits the sense of smell, the second the sense of sight, and the eighth the sense of hearing.

The motor nerves are the third, fourth, sixth, seventh, eleventh and twelfth. The third, fourth and sixth nerves transmit the motor impulses for the eye muscles, which rotate and move the eyeball. The seventh nerve transmits the motor impulses for contraction of the facial muscles and the eleventh for the muscles of the neck. The twelfth nerve causes the movements of the tongue.

The fifth nerve transmits sensory impulses from the eye, teeth and pharynx and the sense of taste and ordinary sensations from the face. It also transmits motor impulses to some of the muscles in the throat. The ninth nerve receives sensory impulses from the tongue and pharynx, and transmits motor impulses to the muscles of the throat and secretory impulses to the salivary glands. The tenth or vagus nerve transmits impulses for regulating heart action.

The Medulla Oblongata: The medulla oblongata or the spinal bulb is a small bulblike structure about an inch and a half long situated at the junction of the brain and spinal cord. It consists of nuclei of gray matter surrounded by various tracts of fibers coming from the brain or passing up to the brain. The nuclei are various vital and reflex centers. The vital centers are the respiratory center, the heart regulating center and the vasomotor center which controls the caliber of these blood vessels.

In addition the medulla contains centers for various reflexes such as vomiting, coughing, sneezing, etc.

The Spinal Cord: The spinal cord is a long cordlike structure situated in the spinal canal extending from the brain to the sacrum. It consists of an inner portion of gray matter which is surrounded by numerous tracts of fibers coming from the brain or passing upward to the brain.

The cells in the front part of the gray matter send out impulses for muscular contraction to the muscles of the extremities and

the trunk. These impulses may be relayed impulses received from the brain by various tracts, or they may originate in the cord. The posterior part of the gray matter receives the impulses of some of the sensations from the skin such as heat and cold. The tracts of fibers which constitute the outer part of the cord transmit motor impulses from the brain, or sensations to the brain.

The Nerves: The nerves are strings or cords of white fibers which carry the impulses to the muscles and glands or receive impulses from the skin, the special senses or other structures. They are of three kinds, efferent, afferent and mixed nerves. The efferent nerves carry motor impulses from the brain or spinal cord to the muscles, and secretory impulses to the various glands. The afferent nerves carry the impulses of sensation from the skin or mucous membrane to the brain or spinal cord. Mixed nerves are nerves which transmit sensory as well as motor impulses. The special senses of sight, hearing, taste, and smell are transmitted by the cranial nerves directly to the brain.

The Autonomic Nervous System

The autonomic nervous system is a group of nerves which control the functions of the organs in the thorax, abdomen and pelvis, as well as the caliber of the blood vessels and the function of numerous other structures. These nerves originate from a chain of small nodules situated along and in front of the spinal cord, which are called ganglia. Each of these ganglia contains a group of small nerve cells which act as relays for many of the nerve impulses passing from the medulla, the brain or the spinal cord, but for the most part they act independently of these influences.

The autonomic nervous system consists of two functionally distinct parts, the sympathetic system and the parasympathetic system. Since the most important nerve of the parasympathetic group is the vagus nerve, this group is often called the vagotonic system. Every organ in the chest and abdomen receives impulses both from the sympathetic and the parasympathetic nerves.

The impulses transmitted by the sympathetic nerves produce opposite effects to those of the parasympathetic nerves.

The sympathetic nerves of the abdominal organs carry impulses for checking function, while the parasympathetic nerves stimulate function. The branches of these nerves which go to the organs in the chest have opposite functions.

The state of contraction or dilatation of the fine blood vessels is also controlled by impulses from various branches of the autonomic nervous system.

The functional capacity of an organ at any particular time depends on the predominating impulses from the autonomic nerves whether they are parasympathetic or sympathetic impulses.

The functions of the autonomic nervous system may be grouped as follows:

Parasympathetic or Vagotonic Nerves

1. Contract the pupil
2. Slow the heart action by impulses along the vagus nerves
3. Dilate nasal blood vessels
4. Contract muscles of bronchial tubes
5. Increase secretions of secretory glands
6. Increase contractions of the gastrointestinal tract
7. Increase uterine contractions

The Sympathetic Nerves

1. Dilate the pupil
2. Increase the heart rate and strength by impulses from the accelerator nerves
3. Control caliber of small blood vessels by contracting some and dilating others
4. Dilate muscles of bronchial tubes
5. Lessen secretions of secretory glands
6. Lessen contractions of the gastrointestinal tract
7. Lessen uterine contractions

Conscious, Subconscious and Reflex Action

Conscious, Subconscious and Reflex action are different ways in which the nervous system functions.

A conscious action is a mental or brain function of which a person is aware.

A subconscious action is a mental function which occurs without consciousness. Dreams are examples of subconscious mental processes. A subconscious action may effect conscious action or personality. Psychoanalysis is a method of analyzing mental processes and subconscious action to determine its effect on consciousness and personality.

Reflex action: A reflex action is a motor, secretory or coördinated action which results from a stimulus to an afferent or

sensory nerve, or a nerve of special sense. The closure of the eyelid, when an object which might cause injury approaches the eye is an example of a reflex action. The evacuation of the bladder and rectum in a child before it learns voluntary control is another example of a reflex action. The mechanism of a reflex action is as follows: An impulse is sent from the skin or mucous membrane along a sensory nerve. When this impulse reaches a center in the spinal cord or brain it immediately generates one or several motor or secretory impulses. These are transmitted along motor or secretory nerves and cause muscular contraction, secretion of glands, a change in heart rate, etc. Many forms of reflex action are controlled by inhibiting or checking impulses from the brain. The voluntary control of the evacuation of the bladder and rectum are examples of such control.

Reflex action is often affected in various diseases of the nervous system. If a tumor or hemorrhage presses on tracts of fibers coming from the brain, the control of reflex action is diminished and the reflexes are increased. The control of bladder evacuation is then lost and the bladder may be emptied in a reflex manner as soon as it is filled.

In some diseases of the spinal cord reflex action is diminished because the centers and tracts along which reflex impulses pass are destroyed.

Symptoms of Disease of the Nervous System

The symptoms of diseases of the nervous system may be divided into several groups according to the disturbance in function, as follows:

1. Motor symptoms
2. Speech disorders
3. Sensory symptoms
4. Trophic symptoms
5. Mental symptoms
6. Disorders of conscious and subconscious action
7. Disturbances in reflexes

Motor Symptoms

The most common motor symptoms are tremors, choreiform movements, convulsions and paralysis.

Tremors: Tremors or twitchings are continued contractions of muscles. They may be general or occur in certain groups of muscles. Localized tremors occur principally in the hands, the

tongue, or in the eye muscles. Tremors are of three kinds: fine, coarse or intention tremors. Fine tremors are very fine twitchings of the muscles which can only be noted when the patient extends the hands. Coarse tremors are irregular movements of the hands or fingers. Intention tremors are tremors which only develop when the patient attempts to grasp an object or use the hands.

In some diseases characteristic tremors develop. In paralysis agitans, for example, there are continuous fine contractions of the hands as if the patient were rolling pills.

Choreiform Movements: These are abnormal involuntary contractions of the muscles of the arms, legs, neck, trunk or face which occur especially in chorea, hence the name. The patient moves the arms and legs about constantly or gets sudden contractions of groups of muscles.

Convulsions: Convulsions are abnormal involuntary contractions of all the muscles of the body. They are usually due to irritation of the motor centers of the brain. There are two kinds of convulsions: clonic and tonic. Clonic convulsions are a series of sudden contractions of all the muscles. Tonic convulsions are sustained continual contractions of all the muscles of the body. During a tonic convulsion the body is held rigid, the arms and legs are stiff, the jaw is set and all the facial muscles are contracted. The contraction of the facial muscles produces a characteristic appearance known as a sardonic grin.

Jacksonian Convulsions: These are sudden contractions of a group of muscles usually of the hands or face, which are often followed by a general convulsion. They indicate irritation of a special area in the motor center in the brain.

Paralysis: Paralysis is the inability of muscles to contract and may be complete or partial. Complete paralysis may be spastic or flaccid. A spastic paralysis is a paralysis in which the muscles are rigid and in a state of contraction. It is due to pressure on the motor tracts in the brain or spinal cord. A flaccid paralysis is a form of paralysis in which the muscles are relaxed. It is usually due to disease of the gray matter in the spinal cord or disease of the nerves. Paresis or partial paralysis is weakened muscular contraction.

The physician is able to determine the exact location of disease in the nervous system by the character and distribution of the paralysis. Paralysis usually occurs in several forms as follows: monoplegia, hemiplegia and paraplegia.

Monoplegia is a paralysis of the muscles of one arm or leg or

of one side of the face. It is usually due to disease of a center in the motor area of the brain which sends impulses to the affected muscles.

Hemiplegia is a paralysis of the muscles of the arm and leg on the same side of the body. It is due to disease in the motor centers or tracts of the brain on the opposite side.

Paraplegia is a paralysis of the extremities on both sides, such as both legs or both arms. It is usually due to pressure on the motor tracts in the spinal cord.

Ataxia is a lack of coördination of muscular movements. It occurs especially in locomotor ataxia. The patient is unable to perform various coördinated movements and has a characteristic gait.

Staggering is a lack of coördination of movements which is usually due to disease of the cerebellum, the semicircular canals or branches of the auditory nerves. The patient may stagger from side to side, or fall forward or backward.

Speech Disorders

The most common speech disturbances are aphasia and stammering. Aphasia is a disturbance in speech which is due to disease of the speech centers in the brain. It occurs in two forms: motor aphasia and sensory aphasia.

Motor aphasia is inability to speak but the patient knows the words he wants to say and the muscles of the tongue or larynx are not paralyzed. Sensory aphasia is inability to understand spoken or written words or sentences but the senses of sight and hearing are not affected.

Stammering is an impediment of speech characterized by repetition of syllables. It is a nervous condition due to lack of control of muscles of the tongue, lips or larynx.

Sensory Symptoms

The sensory symptoms produced by diseases of the nervous system may be divided into two groups:

Symptoms of Irritation

Symptoms of Degeneration

Symptoms of Irritation: The irritation may occur in the course of the nerves or tracts or in the ganglia or centers in the spinal cord or brain where the nerve fibers originate. The symptoms of irritation are an exaggeration of the usual sensations transmitted by the affected nerves or received by the affected center.

Photophobia or increased sensitiveness to light results when the optic nerve or visual tracts are affected. Illusions or hallucinations of sight may result if the visual center is affected.

When the sense of hearing is involved the patient hears noises, or complains of ringing in the ears or is especially sensitive to sound. When the semicircular canals are affected the patient has dizziness or vertigo, and nystagmus, a lateral oscillation of the eyeball.

When the nerves of ordinary sensation are affected pain, hyperesthesia and formication result.

Pain may be very severe or slight and is usually referred to the area from which the sensations are transmitted even if the source of irritation is along the course of the nerves or in the centers. It may be sharp, dull, burning, shooting, or stabbing in character.

Hyperesthesia is increased sensitiveness to touch.

Formication is a sensation as if an insect were creeping on the skin.

When the nerves which transmit temperature sensation or the centers which receive them are affected the patient complains of a sensation of heat or cold on the skin.

Symptoms of Degeneration: The symptoms which result from injury to sensory nerves, sensory tracts or sensory centers in the brain vary with the sensation affected.

Blindness results when the sense of hearing is affected.

Loss of sense of taste or smell results when the nerves or centers for these sensations are affected.

Anesthesia or loss of sensation is a symptom of injury or destruction of sensory nerve tracts or centers. In some diseases only temperature sensations are diminished or absent as a result of injury in centers in the spinal cord.

Trophic Symptoms: These are disturbances in nutrition or growth of tissues which occur in diseases of the spinal cord or the nerves. They often cause ulcers or bedsores or prevent normal growth of a leg or an arm.

Mental Symptoms

The symptoms of disturbances in mental function constitute the symptoms of insanity, mental deficiency or various functional diseases of the nervous system. It is beyond the scope of this book to discuss these symptoms in detail. We may briefly mention, however, some of the common mental symptoms

which the nurse may observe in the course of general diseases or common nervous diseases. They may be divided into two groups: (1) Symptoms of stimulation and (2) symptoms of depression.

The symptoms of stimulation are restlessness and mental confusion if they are mild and delirium if they are excessive. Illusions, hallucinations and delusions frequently develop in various diseases of the nervous system.

Illusions are faulty perceptions received through the various senses, sight, hearing, smell, taste, etc. The patient sees objects but misinterprets them; he sees friends or relatives but he does not recognize them, or mistakes their identity.

Hallucinations are imaginary impressions or sensations. In delirium tremens, for example, the patient imagines that insects are creeping over him.

Delusions are false ideas which may be temporary or permanent. In general paresis, for example, the patient often believes he is physically powerful when he is really so weak that he cannot get out of bed. In some mental diseases as in paranoia the patient has systematized well planned delusions.

The symptoms of depression are mental dullness, loss of memory, drowsiness and melancholia.

Symptoms of Abnormal Conscious Action

The symptoms of disturbed conscious action of the brain are principally disturbances in sleep. They are insomnia, drowsiness, stupor and coma.

Insomnia: This is inability to sleep which may be temporary or chronic. Temporary insomnia may be due to taking coffee or tea in excess, worry, fatigue or other causes. It is sometimes a symptom of various diseases such as acute infections, heart disease or disease of the brain. Chronic insomnia may be due to arteriosclerosis of the brain, heart disease, faulty habits, occupation or other causes.

Drowsiness, Stupor and Coma: These are symptoms indicating diminished conscious action. Drowsiness is a state from which the patient may be awakened readily. Stupor is a state from which the patient can be awakened only with difficulty. Coma is a state from which the patient cannot be aroused at all. These symptoms occur in poisoning by various drugs, in severe toxemias or various diseases of the brain.

Symptoms of Abnormal Subconscious Function: The disturbances of subconscious function are manifested in dreams,

personality problems and the numerous mental symptoms which occur in mental and functional diseases.

Symptoms of Abnormal Reflex Action: The disturbances in reflex action are of two kinds: (1) increased reflexes and (2) diminished reflexes.

Increased reflexes occur in diseases of the brain or spinal cord and result when the disease process affects the tracts which check or inhibit reflex action or when reflex centers are irritated. Some of the common symptoms of increased reflexes are spasms of the rectum or bladder and incontinence of urine or stool and various objective tests.

Diminished reflex action results when a disease process destroys a reflex center or its afferent or efferent nerves. The symptoms are disturbed function of organs which act in a reflex manner and various objective tests. Retention of urine or stool results when the reflex centers for the bladder or rectum in the spinal cord, or any of their nerves, are affected.

Tests for Reflexes

The reflex action is tested principally by the pupillary reflexes and by testing the knee jerks.

Pupillary Reflexes: The size of the pupil of the eye varies according to the amount of light and the distance of an object.

The pupils dilate when the light is diminished and contract when the light is increased. This is called the reaction to light. They also dilate when looking at a distant object and contract when looking at a near object. This is known as the reaction to accommodation. In certain diseases of the nervous system the light reaction or the accommodation reaction is diminished or entirely absent.

Knee Jerks: This is the most common test for reflexes. The patient sits in a chair with the eyes closed. The physician then gently taps the knee just below the patella with a rubber hammer or with his hand. This causes a reflex contraction of the muscles of the leg which jerks the foot forward. Reflex action is diminished if no contraction occurs and increased if the contraction is exaggerated.

Other Reflexes: There are numerous other tests for reflexes, as follows: the ankle clonus; jerking of the foot when it is forcibly flexed; abdominal reflexes, twitching of the muscles when the abdomen is stroked; the Babinski reflex, contraction of the big toe when the sole of the foot is stroked, and others.

Symptoms of Disorders of the Autonomic Nerves

The symptoms which result when the function of the autonomic nerves is disturbed are flushing of the face, excessive perspiration, palpitation of the heart, gastric pains and other symptoms which will be described with the special diseases.

Methods of Examination of the Nervous System

The physician recognizes diseases of the nervous system by examining the sensations, the motor functions, the reflexes, the special senses and sometimes the mentality of the patient. In addition fluid is sometimes obtained from the spinal canal for examination by special tests. It is beyond the scope of this book to describe the various examinations in detail. It is essential, however, for the nurse to understand the purpose of the examinations in order to assist the physician intelligently.

The sensations are examined by testing the ability of a patient to recognize the consistency of objects or their temperature, or to appreciate pain. A disturbance of the motor functions is determined by the presence of spasms, tremors or paralysis. The reflexes are tested by the knee jerks, ankle clonus, abdominal reflexes, Babinski reflex and others.

The examination of the special senses consists of examining the eyes, the hearing and sense of taste and smell. The eyes are examined by an ophthalmologist who determines the acuteness of vision, color blindness, and the function of the eye muscles. The most important eye examination is an examination of the retina with an ophthalmoscope to determine the presence of a "choked disc." This is a swollen optic nerve which usually indicates increased pressure within the skull by a tumor or other organic disease.

The hearing is examined to determine the acuteness of hearing. The function of the semicircular canals is examined by means of various tests, by a turning chair and other methods. The sense of taste is examined to determine the ability of the patient to recognize the taste of various substances. The sense of smell is examined by testing the ability of the patient to appreciate various odors.

The mental processes are examined by Intelligence tests and various other tests.

Lumbar Puncture: The brain and spinal cord are surrounded by membranes which enclose a thin layer of clear fluid. In certain diseases of the brain or spinal cord the quantity and char-

acter of the fluid may be changed. In meningitis it is cloudy and contains pus and bacteria. In edema of the brain and in hydrocephalus the quantity is increased but it is clear.

The fluid from the spinal canal is obtained by a lumbar puncture, which is performed as follows: The patient lies on the side with the knees bent upward and the head bent forward to make the spine convex. A special firm needle and cannula is inserted into the spinal canal at about the level of the fourth lumbar vertebra and the trocar is then withdrawn. If the quantity of fluid in the spinal canal is increased, it flows out under pressure.

Symptoms to be Observed by the Nurse

When nursing diseases of the nervous system the nurse should observe and record the following symptoms:

1. Headache: its location and duration.
2. Motor symptoms: twitchings, spasms or convulsions.
3. Sensory disturbances: pain, numbness, anesthesia, hyperesthia and other sensory disturbances.
4. Special sensations: disturbances in vision, photophobia, disturbances in hearing, taste or smell.
5. Mental symptoms: delirium, illusions, hallucinations, delusions, drowsiness, stupor and coma.
6. Reflex disturbances: frequency of urination, incontinence or retention of urine, and incontinence of stool.

DISEASES OF THE NERVOUS SYSTEM

Diseases of the nervous system may be divided into the following groups:

1. Diseases of the Brain.
2. Diseases of the Spinal Cord.
3. Diseases of the Nerves.
4. Mental Diseases.

DISEASES OF THE BRAIN

Diseases of the brain may be divided into two groups: symptomatic disorders and specific diseases of the brain.

SYMPTOMATIC DISORDERS

Symptomatic disorders are various symptoms referable to the

brain which may be the outstanding symptoms of various diseases of the brain, infections, toxemias or other conditions. They are chiefly headache, convulsions and hemiplegia.

Headache

Headache is pain in the head. It may be dull or throbbing in character or consist of a sensation of a tight band around the head. It may be situated over the entire head, in the temples, in the frontal region or in the occipital region. The headache may be constant or periodic. It may occur especially at certain times, for example, before or after menstruation. Migraine is a form of periodic headache which occurs above the eyes and is associated with nausea and vomiting.

Cause: Headache may be caused by diseases of the brain such as hemorrhage, tumor, syphilis, arteriosclerosis of the blood vessels of the brain, or meningitis. It is a common symptom of infections of the sinuses and diseases of the pituitary gland. It is frequently caused by constipation, infectious diseases, high blood pressure and nephritis.

Treatment: The treatment varies with the cause. Constipation is treated by a suitable diet and various purgatives. High blood pressure is treated by nitrites, luminal and various sedatives. Sinus infections and diseases of the brain are treated by appropriate methods. When a definite cause cannot be found various palliative remedies such as phenacetin, aspirin, pyramidon and similar substances are given.

Convulsions

Convulsions are a series of sudden muscular contractions of the muscles of the body. They occur in two forms: clonic and tonic. A clonic convulsion is a series of repeated muscular contractions. A tonic convulsion is a continued sustained contraction of all the muscles. During a tonic convulsion the body is held rigid, the arms and legs are stiff, the jaw is set and the contraction of the facial muscles produce a characteristic appearance known as a sardonic grin.

Cause: Convulsions are caused by disease of the brain such as hemorrhage in the brain, an embolus, a thrombus, a tumor, or meningitis. It also results from irritation of the brain by various poisons or infections. It may occur in pregnancy and in nephritis as a symptom of uremia. Convulsions often occur in children at the onset of infectious diseases in the same way as a

chill occurs in adults. Epilepsy is a disease characterized principally by convulsions.

Treatment: During a convulsion the patient should be placed in a position which will prevent injury. The nurse should separate the jaws with a spoon or cork to prevent biting the tongue. Sometimes a whiff of chloroform or ether is ordered. A convulsion in a child is treated by a warm bath or a mustard bath.

When the convulsion has subsided the patient should be allowed to rest quietly in bed. The physician will order an enema or a purgative. The remedies usually given to prevent convulsions are chloral, luminal, bromides and other sedatives.

Hemiplegia

Hemiplegia is a paralysis on one side of the body. It is the most common form of paralysis which occurs in diseases of the brain.

Cause: The paralysis is caused by destruction or degeneration of motor areas of the cortex of the brain or the tracts which come from these areas. This may result when one of its blood vessels is blocked by a thrombus or embolus or from pressure by a hemorrhage or tumor.

Symptoms: The paralysis may develop suddenly with a convulsion as in apoplexy or stroke or gradually as in brain tumors. It usually involves an upper and lower extremity on the side opposite to the affected center in the brain because the nerve tracts cross to the opposite side of the spinal cord. A paralysis of the right side of the body is usually accompanied by aphasia or loss of speech because the speech center is situated on the left side of the brain. Sometimes the facial muscles on the same or opposite side are also paralyzed. The paralysis is usually spastic in character and is associated with increased knee jerks and other reflexes. It usually improves gradually but the patient is often left with a permanent paralysis.

Treatment: At the onset the patient is kept in bed and an ice bag is applied to the head. Cathartics, especially drastic purgatives such as croton oil are given to cause frequent bowel movements and relieve congestion in the head. When the patient has recovered from the acute stage the paralysis which remains is treated by massage and electricity to prevent atrophy of muscles, and by strychnine and other tonics to improve their tone.

Subdural Hemorrhage

Subdural hemorrhage is a hemorrhage which occurs between the membranes of the brain and the cortex.

Cause: The condition is caused by fracture of the skull or injury of the skull by the pressure of forceps during childbirth. As a result a clot forms between the dura and the cortex of the brain and produces symptoms of pressure within the skull, or on various centers in the brain.

Symptoms

At the onset the patient may be unconscious, but when consciousness is regained headache, photophobia and convulsions develop. This is followed by focal symptoms, which vary with the location of the hemorrhage. Spastic paralysis on the opposite side of the body develops from a clot over the motor centers, but its extent depends on the size of the clot. A large clot causes a hemiplegia, paralysis of an arm and leg on one side. A small clot causes a monoplegia, paralysis of an arm or a leg or of the facial muscles. Aphasia results if the clot forms over the speech center. In the course of time the paralysis improves because part of the clot is absorbed and the pressure is relieved. A slight spastic paralysis with characteristic spastic movements of a limb usually remains permanently.

Treatment: If the patient is seen early an operation is performed and the clot removed. This may prevent or greatly limit the extent of a permanent paralysis. If operation is not possible the patient is kept quietly in bed, sedatives are given, and the bowels moved thoroughly. When a permanent paralysis is established it is treated by massage, electricity and similar methods.

DISEASES OF THE BLOOD VESSELS OF THE BRAIN

CEREBRAL THROMBOSIS, EMBOLISM AND HEMORRHAGE

Cerebral thrombosis, embolism and hemorrhage are considered together because they produce essentially the same symptoms. These conditions are often called apoplexy.

Cerebral thrombosis is the formation of a clot in the blood vessels of the brain.

Cerebral embolism is a clot which has been carried to the

blood vessels of the brain from some other organ in the body such as the heart.

Cerebral hemorrhage is a hemorrhage into the brain tissue which results from a rupture of a blood vessel in the brain.

Cause: The principal causes of thrombosis, embolism or hemorrhage are arteriosclerosis, old age and high blood pressure. Embolism also occurs in infections, especially in bacteriemia. In arteriosclerosis the inner wall of the blood vessels becomes roughened, which causes a tendency to clot formation. In heart disease a small clot may be loosened from a valve and circulate in the blood stream until it blocks a terminal blood vessel in the brain.

Cerebral hemorrhage results from rupture of a friable blood vessel in arteriosclerosis of the brain, especially when it is associated with high blood pressure.

Pathology: The effect of a thrombus or embolus in a blood vessel in the brain is to deprive a portion of the brain tissue of its blood supply. The affected area will degenerate unless a new circulation is established by neighboring blood vessels. As a result symptoms develop from the loss of function of the affected area: paralysis, if a motor area or tracts are involved, blindness, if the visual center of tracts are affected, etc.

Symptoms

The onset is usually sudden, with a convulsion followed by loss of consciousness. The patient then goes into coma lasting hours or days and presents a typical appearance. The face is flushed, the breathing is deep, heavy and snoring in character and the pulse is slow and strong. The muscles of the extremities, especially on one side, are relaxed. If the coma persists, incontinence of urine and stool develop.

Gradually the patient regains consciousness and develops a typical spastic paralysis, usually a hemiplegia. If this occurs on the right side it is accompanied by aphasia. Sometimes the facial muscles on the same or opposite side are also involved.

Unusual Forms: In some cases the paralysis occurs gradually or suddenly without loss of consciousness.

Sometimes a thrombus, embolus or hemorrhage occurs in other regions of the brain than the motor centers or tracts. The symptoms then depend on the area involved. Sudden blindness may develop when the visual center, optic tracts or nerves are involved. Paralysis of eye muscles results when the centers or tracts for these muscles are affected. Sometimes the only

symptom is headache and dizziness without any focal symptoms because the lesion occurs in an area of the brain which does not produce focal symptoms.

Course: In severe cases the patient never recovers from the coma but develops edema of the lungs and dies.

The milder cases gradually regain some of the power in the affected extremities and the aphasia improves completely. Sometimes the patient is left with a permanent paralysis and develops a characteristic rigid gait and holds the paralyzed arm and forearm in a rigid flexed position.

Treatment

The condition may be prevented by the usual treatment and hygiene of arteriosclerosis. At the onset the patient is put to bed and an ice bag is applied to the head. Drastic purgatives are usually given, especially croton oil or enemas or colon irrigations. The patient should be placed in a water bed as soon as possible to prevent bed sores. If unconsciousness persists rectal or nasal feeding is often necessary.

The hemiplegia is treated by massage, electricity, potassium iodide, strychnine and similar remedies.

CEREBRAL ARTERIOSCLEROSIS

Arteriosclerosis of the brain is a condition characterized by thickening of its blood vessels. The process may involve only a few blood vessels or many of them. The walls of the blood vessels lose their elasticity and as the disease progresses the increasing thickness may diminish or obliterate the lumen of some of the blood vessels. As a result the supply of blood in some areas of the brain is diminished. When the lumen of a blood vessel is obliterated an area in the brain is entirely deprived of its blood supply and degenerates, unless its circulation is reëstablished by neighboring vessels (collateral circulation).

Symptoms

The symptoms are variable and depend on the extent, location and degree of the condition. When the arteriosclerosis is not localized the patient may suffer from sleeplessness, headache, dizziness, or loss of memory or other symptoms due to a loss of elasticity in the blood vessels. When it affects the motor centers the patient sometimes complains of numbness in an arm or leg

or in the extremities on one side of the body. In severe cases, especially when the arteriosclerosis is associated with high blood pressure, the patient may have an apopleptic stroke with hemiplegia. This may occur suddenly from a hemorrhage following a rupture of a thickened blood vessel, or from an embolus. Sometimes a blood vessel is gradually obliterated and an arm or leg becomes weak and gradually paralyzed.

Treatment: The treatment consists of the usual treatment of arteriosclerosis already described. When apoplexy occurs it is treated in the usual manner.

SYPHILIS OF THE NERVOUS SYSTEM

Syphilis of the nervous system may affect the brain, the spinal cord and other parts of the nervous system. It is a frequent manifestation of the third stage of syphilis. The symptoms resemble other diseases of the brain but the syphilitic nature of the disease is recognized by a positive Wassermann test. The disease usually occurs in three forms as follows:

1. Gumma of the brain
2. General Paresis
3. Cerebro-spinal syphilis

GUMMA OF THE BRAIN

Gumma of the brain may affect any region of the brain and consists of the formation of a gumma in the brain tissue.

Symptoms: The symptoms depend on the location of the gumma. When the motor centers in the cortex are affected the patient may develop a monoplegia, paralysis of one arm or leg. If the motor tracts or the entire motor area in the cortex are affected a hemiplegia occurs, a paralysis of an arm and leg on one side of the body.

The disease is treated by the usual anti-syphilitic remedies.

General Paresis

General Paresis is a disease of the brain caused by syphilis. The syphilitic process causes degeneration of various areas on the surface of the brain.

Symptoms

The symptoms vary with the areas of the brain affected and

may be physical or mental or both. In some cases the physical and in others the mental symptoms predominate.

Physical Symptoms: The physical symptoms may be paralysis or twitchings of the muscles. The muscles on one side of the face may become paralyzed. There may be twitchings of the lips, of the tongue or of one hand. Sometimes convulsions occur. Speech defects are very common and the patient cannot pronounce certain words correctly, especially a number of words containing the same letters. There are other evidences of syphilis of the brain such as irregular pupils, increased reflexes, etc. As the disease progresses the patient gradually develops weakness in all the muscles which finally becomes so extreme that he remains in bed a helpless invalid with a loss of control of bowel movements and urine.

Mental Symptoms: The mental symptoms are very mild at first and begin with careless habits. The patient becomes unreliable and develops a tendency to exaggerate. Gradually he develops grandiose ideas, he overestimates his physical powers, his mental capacities, accomplishments, etc. The nature of the disease may not be recognized until the patient gets into financial and other difficulties as a result of overconfidence in his abilities.

The disease usually lasts about three to five years and is fatal.

Treatment

Preventive treatment consists of early and intensive administration of the usual antisyphilitic remedies.

When the disease has developed, salvarsan, mercury and iodides are the usual remedies employed. A recent method of treatment consists of inoculating the patient with malarial parasites. The typical chills and fever of malaria which result seem to have a beneficial effect on the disease. Tryparsamide is a new arsenic preparation which is frequently used.

When the mental symptoms predominate, the patients are usually confined to institutions for the insane.

Cerebro-Spinal Syphilis

Cerebro-spinal syphilis is a form of syphilis of the nervous system which affects the brain and spinal cord. In some cases the brain is principally affected while in others the spinal cord.

The disease process consists of syphilitic involvement of the blood vessels, syphilitic disease of the meninges or coverings of the brain, and sometimes syphilitic deposits in the brain tissue or on the surface of the brain.

Symptoms

The symptoms are a combination of symptoms of general paresis, locomotor ataxia and focal symptoms caused by syphilitic involvement of various areas of the brain.

The symptoms of the cases that are not typical paresis or locomotor ataxia are variable. Headache and dizziness are the most common symptoms. In addition a paralysis of an arm or leg may develop, or a hemiplegia. Sometimes there are twitchings of the muscles of the face or other muscles. The eye muscles are often paralyzed and cause the eye to turn outward.

The pupils of the eye are usually affected, they become irregular in shape and they may not react to light or accommodation. Rigidity or weakness of various groups of muscles may occur. The knee jerks are usually exaggerated. In some cases a paralysis like that of locomotor ataxia develops.

The syphilitic nature of the disease is determined by a positive Wassermann test of the blood and spinal fluid, an increase in the number of leucocytes in the spinal fluid, and by a special test known as the colloidal gold test.

Treatment: The disease is treated by the usual antisyphilitic remedies, salvarsan, mercury and iodides. Shock treatment with typhoid vaccine and malarial inoculation are sometimes tried.

BRAIN TUMOR

Tumor of the brain is a new growth which forms within the brain tissue or on the surface of the brain. It may be a benign or a malignant tumor. The benign tumors and some forms of malignant tumors originate in the brain itself. Many of the malignant tumors however develop in the brain as migrated growths or metastases from a tumor elsewhere in the body.

Symptoms

The symptoms of tumor of the brain are of two kinds:

1. Pressure symptoms
2. Focal symptoms

Pressure Symptoms: The pressure symptoms are due to an increase in the contents of the skull. They are intense headache, vomiting and progressive failing vision, which gradually develops into partial or complete blindness. The most important and characteristic symptom is choked disc or papiledema, which results from pressure on the optic nerves.

Focal Symptoms: The focal symptoms only occur when the tumor is situated in areas of the brain whose function is known. When the tumor is situated in the motor area twitchings of groups of muscles, convulsions, and various forms of paralysis result such as monoplegia or hemiplegia. If the speech center is affected aphasia develops. Jacksonian convulsions are peculiar convulsions which occur in some forms of tumor. They begin with aura or premonitory symptoms such as twitchings of a hand or a foot or a flash of light. They are due to irritation of a particular area in the motor center of the cortex of the brain and usually indicate the location of the tumor. A tumor in other parts of the brain may produce dizziness, staggering, disturbances in hearing and other symptoms.

The exact location of a tumor in the brain is determined by typical focal symptoms. The tumors which occur in areas of the brain whose function is unknown produce only symptoms of increased pressure within the skull, but no focal symptoms.

Treatment

The treatment is surgical. If the location of the tumor can be determined the skull is opened and the tumor is removed. If the tumor is not accessible or if it cannot be located a decompression operation is performed to relieve the increasing pressure within the skull and prevent permanent blindness.

BRAIN ABSCESS

Abscess of the brain is the formation of an abscess within the brain tissue.

Cause: The abscess usually develops from extension of a middle ear infection, mastoiditis or infected sinuses.

Symptoms

The symptoms are principally headache, vomiting, temperature and focal symptoms similar to those occurring in brain tumor, following the usual causative disease. The temperature may be a continuation of the fever of the original disease or it may rise suddenly. As a rule the temperature is not very high, about 100° F, and is accompanied by a rapid pulse and frequent chills.

The focal symptoms depend on the location of the abscess and may be twitchings of muscles or a focal paralysis, such as

monoplegia or a hemiplegia. Sometimes delirium, convulsions and mental symptoms develop.

The treatment is surgical, consisting of opening the skull, locating the abscess and draining the pus.

PARALYSIS AGITANS

Paralysis Agitans, Parkinson's disease or Shaking Palsy is a disease of the brain characterized by peculiar twitchings and paralysis.

Cause: The disease frequently follows sleeping sickness but it also occurs in old people as a manifestation of progressive degenerative changes in the brain.

Symptoms: The symptoms are continual characteristic twitchings of the fingers and hands which produce a motion as if the patient were rolling pills. This is associated with a peculiar shuffling gait, a blank facial expression, and drooling of saliva. The symptoms usually disappear when the patient is asleep.

Treatment: The disease is treated by atropine, hyoscine, parathyroid extract, calcium salts and similar remedies and by electricity and massage to improve the tone of the muscles.

DISEASES OF THE MENINGES

The meninges of the brain are the membranes which cover the surface of the brain. They are the dura mater, arachnoid, and pia mater.

MENINGITIS

Meningitis is an inflammation of the membranes covering the brain. It occurs in two forms: acute meningitis and tuberculous meningitis.

Acute meningitis is an infection of the membranes of the brain which results from an injury to the skull such as a fracture or from extension of a middle ear infection, mastoiditis or sinus infections.

Epidemic cerebrospinal meningitis is a form of meningitis caused by a specific germ, the Meningococcus. It usually occurs in epidemics and has already been described.

Tuberculous meningitis is a form of meningitis caused by the tubercle bacillus.

Chronic Basilar meningitis is a form of meningitis which sometimes follows the epidemic meningitis and is due to a chronic infectious process at the base of the brain.

Symptoms

The disease usually begins suddenly with headache, fever, convulsions and vomiting. The vomiting is projectile in character, that is, it occurs suddenly without warning, even at night. The fever persists, the neck becomes rigid, a Kernig sign and exaggerated reflexes develop. Gradually symptoms develop which indicate the location of the infection in various parts of the membranes or brain tissue, such as paralyses of muscles. The eye muscles are usually involved and the eye turns outward. Other forms of paralyses may occur which indicate the extension of the process to other areas of the brain or its membranes.

As the disease progresses the patient becomes drowsy, gradually goes into stupor and coma and dies.

The nature of the disease is determined by examining the spinal fluid. When a lumbar puncture is performed the fluid comes out under pressure, it is cloudy and contains pus and the causative germ, such as the meningococcus, the tubercle bacillus, or other germs.

Treatment

The treatment depends on the cause. Epidemic cerebrospinal meningitis is treated by injection of the specific antimeningococcus serum into the spinal canal. The other forms are treated symptomatically. Repeated lumbar punctures are often performed to remove the infectious material from the spinal canal. Urotropin is sometimes given for its antiseptic effect on the spinal fluid. Sedatives are given to relieve delirium or convulsions.

The patient should be kept in a quiet dark room and is given the usual nursing care for fever cases.

CHRONIC BASILAR MENINGITIS

This is a rare form of chronic meningitis which may result from epidemic meningitis. It is characterized by a marked bending backward of the spine (opisthotonus) and the persistence of the symptoms of meningitis.

HYDROCEPHALUS

Hydrocephalus or water on the brain is a disease characterized by the accumulation of fluid in the ventricules of the brain.

The disease is usually congenital and occurs principally in children. It sometimes follows tuberculous meningitis, a tumor of the brain or other diseases of the brain.

Symptoms: The head becomes large and the fontanelles remain open. The children do not develop physically and mentally and they rarely live to adult life.

The disease is treated by removing the fluid repeatedly by means of a lumbar puncture. Sometimes the fluid is removed from the brain directly by inserting a needle through the skull into the brain.

DISEASES OF THE SPINAL CORD

Diseases of the spinal cord may affect the nerve tracts in the cord or the gray matter or both.

Spinal Cord Symptoms

The symptoms of spinal cord disease depend on the location of the disease process, whether it affects the nerve tracts or the centers in the spinal cord.

Symptoms of Disease of Nerve Tracts

Diseases of the nerve tracts cause principally sensory or motor symptoms or disturbances in reflexes.

Sensory Symptoms: The sensory symptoms are increased or diminished sensation, or complete loss of sensation.

When the appreciation of sensation is increased the patient may complain of hyperaesthesia and sometimes of abnormal sensations, such as formication, a feeling as if ants or insects were creeping on the skin. Diminished sensation causes numbness or anesthesia in specific areas of the skin. Sometimes only special sensations such as heat or cold or the muscular sense are affected.

Motor Symptoms: The motor symptoms are paralysis of various groups of muscles in the lower extremities or trunk muscles below the level of the disease process. The paralysis is of a spastic character, that is the muscles are rigid and in a constant state of contraction.

Symptoms of Disease of Spinal Centers: When the centers in the anterior part of the spinal cord are affected, groups of muscles below the level of the disease process become paralyzed. The paralysis is flaccid in character, that is the muscles are relaxed. When the centers in the posterior part of the spinal cord are affected sensory symptoms, especially failure to feel heat and cold, develop.

Changes in Reflexes: Various reflexes are usually disturbed in disease of the spinal cord, but the nature of the disturbance varies with the location of the disease process. When disease affects the nerve tracts, the reflexes are increased, the patient is therefore unable to control the action of the bladder or rectum, and urine and stool are passed involuntarily.

When disease affects the centers of the cord there is a loss of reflex control of the bladder and rectum. This causes distention of the bladder and rectum and delay in evacuation.

Locomotor Ataxia

Locomotor ataxia or Tabes Dorsalis is a chronic disease of the spinal cord characterized by lack of coördination of muscular movements and a characteristic gait known as ataxia.

Cause: The disease is a manifestation of the third stage of syphilis and may occur as long as fifteen or twenty years after the syphilitic infection. It results from a syphilitic process involving the nerve tracts in the posterior part of the spinal cord. In many cases the brain is also involved and the disease is part of cerebrospinal syphilis.

Symptoms

The symptoms develop gradually, beginning with disturbances in sensation, such as shooting pains down the legs, peculiar sensations in the feet or around the anus. Sometimes the patient gets severe attacks of sharp pains called "crises." These pains occur especially in the stomach and are associated with vomiting attacks. Similar attacks of pain may occur in other organs, such as the heart, intestines and urinary tract.

As the disease progresses, the patient develops a characteristic incoördination of muscular movements which is the essential feature of the disease. It is especially noticeable in the gait and when the patient attempts to button his clothes or to grasp objects. The gait is typical and is called ataxia. The patient lifts his feet high, brings them down rather forcibly and keeps them wide apart. He is able to walk without staggering only

by watching his steps, but in the dark he is unable to maintain his equilibrium or even to walk at all.

Special Tests: The disease is usually recognized by the following tests:

1. The knee jerks and similar reflexes are diminished.
2. The incoördination is often determined by the inability of the patient to touch the tip of his nose with his finger or to place the heel on his leg when his eyes are closed.
3. The Argyle Robertson reaction: The pupil contracts to light but not to accommodation.
4. The Romberg test: inability to stand with the feet together when the eyes are closed.

In the terminal stage of the disease the patient is unable to walk, he loses complete control of urine and stool, and becomes a bed ridden invalid.

Complications: The most common complications are associated symptoms of syphilis of the brain, which may cause blindness, paralysis of eye muscles and other symptoms already described.

Sometimes painless ulcers on the feet develop because the nutrition of the tissues is disturbed.

Chronic Cystitis and infection of the urinary tract and kidneys are other common complications.

Treatment

The disease is treated by the usual remedies for syphilis such as salvarsan, mercury and iodides. The salvarsan is sometimes injected into the spine. The patient has to walk with a cane because of the ataxia and is sometimes taught various exercises to improve his gait. Massage and electricity are used to improve the tone of the muscles. When the patient is bedridden he should be kept on a water bed and bed sores prevented by scrupulous care of the skin. When retention of urine develops the patient is usually catheterized at frequent intervals. Cystitis and pyelitis are treated by urotropine, caprokol and other urinary antiseptics and by bladder irrigations.

MYELITIS

Myelitis is a disease of the spinal cord characterized by paralysis of extremities, or groups of muscles and disturbances in sensations. The disease occurs in an acute and chronic form and is usually described according to the type of paralysis or

the nature of the process as follows: Spastic Paraplegia or Transverse Myelitis.

Spastic Paraplegia is a spastic paralysis of the lower extremities due to disease or injury of the nerve tracts of the cord. Transverse myelitis is a degeneration of an area in the spinal cord which occurs at a level of the spine.

Cause: Myelitis may be caused by an injury such as a fracture of the spine, by disease of the vertebrae, such as tuberculosis, or by the pressure of a tumor in the spinal canal or the spinal cord. It is sometimes caused by various infections.

Infantile paralysis or Anterior Poliomyelitis is a specific form of myelitis probably caused by a special germ which has already been described under infectious diseases.

The disease process is a degeneration of various tracts or centers in the gray matter of the spinal cord.

Symptoms

The symptoms may be divided into three groups: sensory symptoms, paralysis, and disturbed reflexes.

The sensory symptoms are very characteristic and consist of numbness and finally complete anesthesia of areas in the skin of the trunk and extremities, below the level of the injury or disease process. The physician is able to determine the exact location of the disease in the cord by the extent and nature of the sensory symptoms.

The paralysis usually occurs in the extremities or trunk below the level of the spine where the disease is located. It is spastic in character when the disease is a tumor or injury which presses on the nerve tracts. The paralysis is flaccid if the gray matter of the cord is involved.

The reflexes are increased when the disease process presses on the nerve tracts. This may cause incontinence of urine and stool. If the gray matter is involved the reflexes are diminished. As a result the bladder and rectum become distended and cannot be evacuated and the patient will have to be catheterized frequently.

Treatment

The disease is treated surgically by removing the pressure on the spinal cord such as a tumor or bone. If the cause is not amenable to surgical treatment the patient is kept in bed, usually on a water bed to prevent bed sores. The bladder is catheterized at frequent intervals and urinary antiseptics are given to prevent cystitis. Massage and electricity are given to improve the tone

of the paralyzed muscles. Strychnine is ordered to improve the function of the spinal cord centers.

CHRONIC MYELITIS OR PROGRESSIVE MUSCULAR ATROPHY

Chronic myelitis or progressive muscular atrophy is a disease occurring in middle life characterized by wasting of various groups of muscles. The disease process consists of degeneration of the centers in the anterior part of the gray matter of the spinal cord.

Symptoms

The symptoms begin gradually and are principally progressive wasting of the muscles of the hands and arms. As a result the hands, forearms and arms become contracted in a flexed position. Gradually the lower extremities are similarly affected and the patient becomes a helpless bed ridden invalid for years.

Glossolabiolaryngeal Paralysis is a form of chronic myelitis which affects the cervical part of the spinal cord and the medulla. It causes disturbances in swallowing and breathing because of the gradual paralysis of the muscles in the pharynx and larynx.

The disease is treated by massage, electricity, strychnine and similar measures to improve the tone of the muscles.

SYRINGOMYELIA

Syringomyelia is a disease of the spinal cord characterized by degeneration of the central gray matter. It may be caused by syphilis, infections, injuries or tumors.

Symptoms: The symptoms are chiefly a loss of heat and cold sensations and sometimes other sensations. As a result the patient frequently gets severe burns or ulcers from touching hot or cold objects, which he cannot feel. The knee jerks are usually diminished.

Treatment: The treatment consists of removing or treating the cause, such as the tumor, syphilis or injury. As a rule however the disease is not amenable to treatment because the injury to the cord is a permanent one, but the patient must be prevented from coming in contact with hot or cold objects.

Multiple Sclerosis

Multiple or disseminated sclerosis is a disease of the spinal cord of unknown origin characterized by symptoms resulting

from the formation of connective tissue in various areas of the spinal cord.

Symptoms: The essential symptoms are an intention tremor, scanning speech, fine lateral movements of the eyeballs, weakness and stiffness of the legs followed by spastic paralysis and increased knee jerks.

The intention tremor is a fine tremor of the hands which develops when the patient attempts to hold an object such as a glass of water. The scanning speech is a peculiar speech characterized by emphasizing syllables as in reciting poetry. As the disease progresses, emotional upsets, various other mental symptoms and bladder disturbances result.

The disease is treated by strychnine, tonics such as arsenic, massage and electricity. Inoculation with malarial parasites to produce chills and fever is often tried.

DISEASES OF THE NERVES

Diseases of the nerves may affect single nerves or groups of nerves. They occur in two forms (1) Neuritis, (2) Neuralgia.

Neuritis is an inflammation of a nerve which results from an injury or an infection. Neuralgia is a disease of a nerve, in which there is no apparent injury or inflammation.

NEURITIS

Neuritis is an inflammation or injury of a nerve or group of nerves. When the disease affects one nerve it is usually called by the name of the nerve affected. For example: A Musculo Spiral Neuritis is a neuritis of the musculo spiral nerve. When a neuritis affects several nerves it is usually called Multiple Neuritis.

Cause: The cause of neuritis may be an injury, pressure by a tumor or bony growth, or abnormal posture. It is sometimes caused by poisons such as alcohol or lead or by the poisons of infectious diseases, such as diphtheria. Some forms of neuritis such as beriberi is caused by a vitamine deficiency.

Neuritis is sometimes classified according to its cause as follows: Traumatic Neuritis, Infectious Neuritis, Toxic Neuritis, Lead Palsy, etc.

Symptoms

The symptoms of neuritis vary with the type of the nerve affected.

Neuritis of a sensory nerve causes disturbances in sensation in the area of skin from which the impulses are transmitted. Neuritis of a motor nerve causes paralysis of the muscles to which the impulses are transmitted.

Sensory Symptoms: The disturbances in sensation are pain, hyperaesthesia, or increased sensation, or formication, a sensation as if insects or ants were creeping on the skin. Sometimes blisters form along the course of the affected nerve (herpes). If the nerve is completely injured numbness or anesthesia develops in the area of the skin from which the impulses are transmitted.

Motor Symptoms: The symptoms of neuritis of a motor nerve are weakness in the muscles innervated by the affected nerve. If the nerve is completely injured a flaccid paralysis of the muscles results.

Specific Forms of Neuritis

Sciatica

Sciatica is a neuritis of the sciatic nerve.

Cause: The disease may be caused by absorption of poisons or pus from focal infections in the teeth, tonsils, colon or other parts of the body. It occasionally results from the pressure of a bony growth in the lumbar vertebræ of the spine. It frequently develops after exposure to cold and wet or without any apparent cause.

Symptoms: The symptoms are severe pains extending along the back of the leg to the calf or upwards toward the back. The pain is very severe and is sometimes accompanied by weakness in the muscles of the leg.

Treatment: The treatment consists of removing the focus of infection in the teeth or tonsils or other organs. If this is not effective or if a cause cannot be found, baking, massage, electricity, diathermy, baths or colon irrigations are the forms of treatment given. Salicylates, atophan, phenacetin and pyramidon are the remedies given.

Facial Paralysis or Bell's Palsy

Facial paralysis or Bell's Palsy is a neuritis of the facial nerve.

It may follow an injury of the nerve in the course of a mastoid operation or exposure to wet and cold or infections.

The symptoms are paralysis of the muscles on one side of the face and inability to close the eyelids. The patient is unable

to smile or frown on the affected side. He has difficulty in chewing and food accumulates between the affected cheek and teeth. Sometimes the patient loses the sense of taste. The paralysis usually improves in about six weeks. The disease is treated by massage and electricity, salicylates and coal-tar remedies.

Multiple Neuritis

Multiple neuritis is a form of neuritis characterized by various sensory or motor symptoms according to the nerves affected. The disease usually results from alcohol, lead poisoning, diphtheria or other infections.

Alcoholic Neuritis: Alcoholic neuritis affects principally the nerves of the arms and legs and causes paralysis of the flexor muscles of the forearms and legs, producing a drop hand or drop foot. The patient is unable to extend the affected hand or foot. The gait is characteristic and is called steppage gait because the patient walks like a horse.

Korsakoff's Psychosis is a group of psychical symptoms, especially a lack of appreciation of time and place, associated with alcoholic neuritis.

The neuritis is treated by eliminating alcoholic beverages and giving massage and electricity to improve the paralysis of the muscles. The paralysis usually improves completely.

Lead Palsy: Lead palsy is a form of multiple neuritis which occurs especially in painters, typesetters or others who constantly handle lead in their occupation.

The symptoms are chiefly paralysis of groups of muscles, causing a drop foot or drop hands. They are associated with other symptoms of lead poisoning, such as a lead line at the junction of the gums and teeth, abdominal cramps and anemia.

The disease may be prevented by proper control of factories where lead is used. The workers should wear gloves and wash their hands thoroughly before meals. The paralysis is treated by massage and electricity. Magnesium sulphate and potassium iodide are the remedies usually administered to increase the elimination of the lead. The anemia is treated by iron and the usual diet for anemia.

Post Diphtheritic Neuritis: Post diphtheritic neuritis is a form of neuritis which follows diphtheria. It usually affects the nerves of the palate muscles or the nerves of the heart, especially the vagus nerve.

The symptoms are difficulty in swallowing and regurgitation of food through the nose when the palate muscles are paralyzed.

When the nerves of the heart are affected the patient may die suddenly or develop irregular heart action.

Preventive treatment consists of giving sufficient antitoxin early in the disease. The neuritis is treated by rest in bed, strychnine and other tonics.

Herpes Zoster

Herpes Zoster is a disease which is probably a neuritis of sensory nerves. It is characterized by pain and the formation of blisters along the course of the nerves. The intercostal nerves, which are situated along the ribs, are most frequently affected.

Herpes of the lips is a common symptom in some of the infectious diseases, such as pneumonia, meningitis, or malaria.

The treatment consists of applying dusting powder, collodion and various ointments over and around the blisters. The pain is sometimes relieved by phenacetine, pyramidon, salicylates and similar remedies.

Trigeminal Neuralgia

Trigeminal neuralgia is a neuritis or neuralgia of the fifth or trigeminal nerve characterized by severe and excruciating pain along the course of the various branches of the fifth nerve.

The cause of the disease may be a focal infection in the teeth, or sinuses or diseases of the ganglion of the fifth nerve within the skull.

The symptoms are severe pain in the teeth, face and head, which often occurs in attacks.

The disease is treated chiefly by removing the focus of infection. The pain is treated by coal-tar remedies, pyramidon, phenacetin, salicylates and other remedies.

In severe cases branches of the nerves are injected with alcohol and sometimes the ganglion of the nerve within the brain is removed.

Uncommon Forms of Neuralgia

Intercostal neuralgia and Brachial neuralgia are uncommon forms of neuralgia. The symptoms are pain along the course of the affected nerves. The treatment is the same as in other forms of neuritis or neuralgia.

FUNCTIONAL DISORDERS OF THE NERVOUS SYSTEM

Functional disorders of the nervous system are diseases characterized by symptoms indicating abnormal function of the

nervous system without evidence of structural changes. The most common functional diseases are Neurasthenia, Psychasthenia, Hysteria, Epilepsy and Chorea.

NEURASTHENIA

Neurasthenia is a functional disease of the nervous system characterized by various symptoms indicating exhaustion, improper balance and control in the function of the entire nervous system. The disease is sometimes described by various names, according to the type of symptoms which predominate, as follows: Psychasthenia, Autonomic Dysfunction or Imbalance, Gastric Neurosis and Cardiac Neurosis.

Psychasthenia is a form of neurasthenia in which the mental or psychical symptoms predominate.

Autonomic Dysfunction or Imbalance is a form in which the symptoms are chiefly in the organs of the chest and abdomen.

Gastric Neurosis is a form in which the chief symptoms are referable to the stomach.

Cardiac Neurosis is characterized chiefly by cardiac symptoms.

Cause: The cause of neurasthenia may be divided into predisposing and exciting causes.

The disease is more prevalent in women and is frequently hereditary. It commonly occurs in thin, nervous, hypersensitive, introspective persons who have low blood pressure, low-hanging organs and suffer from fatigue.

The exciting cause is usually mental fatigue or emotional shock. This may be caused by hard work, excessive worry, severe infections such as typhoid or pneumonia. A sudden emotional shock may bring on a severe attack of symptoms. During the World War neurasthenia frequently developed in predisposed recruits when they were under shell fire or when anticipating going into action. Shell shock is a form of neurasthenia which commonly occurred among many of the soldiers.

Symptoms

The symptoms may be divided into physical and psychical symptoms and personality manifestations. While each group of symptoms is present in every case, many patients manifest one type of symptoms more than others. Thus some patients complain chiefly of physical symptoms, others of psychical symptoms, and some manifest only the peculiarities of their characteristic personality.

Physical Symptoms: The physical symptoms affect principally the circulation, the stomach, and the autonomic nervous system which controls the function of many organs in the chest and abdomen.

The circulatory symptoms are palpitation of the heart, a rapid pulse and various pains over the heart area, flushing of the face, sudden pallor, cold, moist hands and low blood pressure. The stomach symptoms are very common and are chiefly pain after eating, indigestion, cramps in the abdomen, fullness, distention with gas or belching. Sometimes symptoms in other abdominal organs such as frequency of urination and cramps in the lower part of the abdomen. The patient usually complains of headache, dizziness and pains all over the body. As the disease progresses the patient loses steadily in weight and strength.

Psychical Symptoms: The mental or psychical symptoms are variable. The chief symptom is mental fatigue, which is often so marked that it is an effort for the patient to perform even the simplest mental process. The patient is unable to concentrate, becomes irritable and restless, and is often obsessed with abnormal fears. He is afraid to cross the street or ride in a street car or to be alone. Frequent emotional upsets such as crying spells or fits of temper without provocation are common symptoms and sometimes depression and melancholia develop. Many patients suffer with sleeplessness.

Personality Manifestations: The chief feature of the neurasthenic personality is a craving for attention. Consequently all sorts of symptoms develop as a result of a subconscious desire for attention and sympathy from friends, doctors and nurses. The patient is self-centered and introspective, he discusses his symptoms at great length, analyzes them minutely and often keeps a detailed record of them.

Treatment

The disease is treated by preventive measures, a rest cure and various remedies.

Prevention: Neurasthenia may be prevented by proper mental hygiene which consists of adjusting the susceptible person to life and his environment. Physical exercise outdoors, an occupation relatively free from worry and mental strain, the avoidance of mental and emotional shocks and the cultivation of a hobby are often successful preventive measures.

Rest Cure: The usual form of treatment is a rest cure. This

is often accomplished by a change of scene and climate such as a trip to the country or an ocean voyage.

The severe cases are usually kept in bed, preferably in a sanitarium or hospital with pleasant surroundings. A high caloric diet consisting chiefly of milk, eggs and all sorts of nourishing and appetizing food is usually ordered. Physical treatments such as various baths, cold packs and massage are usually given. The remedies usually ordered are principally sedatives, such as luminal or bromides, and glycerophosphates and other tonics.

Nursing Care: The nursing care of neurasthenia is an important part of the treatment. The nurse should attempt to understand and accentuate the personality of the patient. She should be interested and sympathetic but firm, and she should inspire confidence. The patient's mind should be occupied by varying the daily routine with new interests. Above all, the nurse should emanate health and the joy of living. The patient should be allowed to convalesce gradually. As soon as the fatigue disappears, long walks and various forms of physical exercise should be advised.

HYSTERIA

Hysteria is a disease characterized by emotional outbursts and a lack of control of the functions of the nervous system. It occurs especially in women with an hereditary predisposition. The disease frequently resembles neurasthenia and psychasthenia.

Symptoms

The symptoms are much more common during adolescence, around the menstrual periods and at the menopause. They result principally from a subconscious desire for attention and occur in the following forms:

1. Emotional outbursts.
2. Functional paralysis.
3. Sensory symptoms.
4. Visceral symptoms.

Emotional Outbursts: The characteristic symptoms of hysteria are sudden emotional attacks. They may result from a mental, emotional or physical shock or occur without any apparent cause. The patient suddenly gets a fit of crying alternating with laughing. Sometimes fainting attacks or convulsions occur which may resemble epilepsy, but the patient never bites the

tongue or injures herself in falling in any way. The attacks are usually followed by headache and intense exhaustion.

Paralysis: Paralysis of groups of muscles is quite common in hysterical patients, but it never involves definite groups of muscles as in organic diseases. A leg may be paralyzed on one side of the body and an arm on the opposite side or muscles in various parts of the body are affected.

Catalepsy, a condition in which the body is held rigid for hours, sometimes occurs in hysteria. Hysterical aphonia, or sudden loss of voice is a common symptom.

Sensory Symptoms: The sensory symptoms may be anesthesia of an entire half of the body or local areas of hyperestheisa, anesthesia and temporary disturbances in special sensations; sight, hearing, smell or taste.

Visceral Symptoms: The visceral symptoms are flushing of the skin, pallor, excessive perspiration, rapid pulse rate and other symptoms.

Treatment

The treatment is the same as that of neurasthenia. The hysterical patient is very susceptible to suggestion and various forms of psychical treatment are commonly used such as psychoanalysis, hypnotism and other methods.

EPILEPSY

Epilepsy is a disease characterized by the occurrence of convulsions at irregular intervals. The cause of the disease is unknown, but it occurs especially in young persons.

Symptoms

The chief symptoms of the disease occur in two forms:

1. Grand Mal Attacks
2. Petit Mal Attacks.

Grand Mal Attacks: The attack usually occurs suddenly without any premonitory symptoms, but it is sometimes preceded by a flash of light or a sound. The extremities suddenly become rigid, a convulsion follows almost instantly which throws the patient forward. The convulsion consists of a series of clonic contractions of all the muscles of the body. The patient froths at the mouth and often bites the tongue. During the attack the face is blue and pupils are dilated.

The attack lasts for a few minutes and is followed by stupor

which may last hours. When the patient awakes he complains of severe headache in the temples and weakness. As a rule the attacks occur at intervals of weeks or months. In severe cases convulsions may occur almost daily.

Petit Mal Attacks: These attacks consist of a sudden momentary loss of consciousness without convulsions. The patient may become suddenly dazed or unconscious for a moment in the course of a conversation or at meals. The face suddenly becomes pale, the trend of thought is lost or the patient becomes absent-minded. Sometimes jerking movements of the head or twitching of the facial muscles occur. A patient may have a petit mal attack at one time and a grand mal attack at another.

Treatment

The disease is treated by measures to relieve the attack, diet and various remedies.

During an attack the patient should be prevented from biting the tongue by placing a cork, a piece of wood or a spoon between the teeth. Chloroform or ether are sometimes given to stop the convulsion.

The attacks of epilepsy can often be prevented by dietary treatment. The diets commonly used are the starvation treatment, the high fat or ketogenic diet and the low carbohydrate diet.

The starvation treatment consists of keeping the patient on starvation followed by a very low calory diet for two or three weeks.

The high fat diet contains excessive quantities of fat. It causes a relative acidosis which sometimes relieves the frequency and severity of the attacks.

When attacks result from indigestion or intestinal disturbances the carbohydrates in the diet are limited and other dietary changes are ordered.

The remedies used for epilepsy are bromides and luminal, atropine and pituitary extract.

CHOREA

Chorea or St. Vitus' Dance is a disease of childhood characterized by peculiar incoördinated movements. The cause of the disease is unknown, but it is apparently associated with rheumatic fever and attacks of tonsilitis.

Symptoms: The symptoms are peculiar incoördinated move-

ments of the arms and legs. The children are restless and fidgety and move about constantly. In severe cases they may toss around in bed. In mild cases there are spasms of groups of muscles of the face or hands.

The disease is frequently complicated by endocarditis and valvular heart disease.

Treatment: The severe cases are treated principally by rest in bed. The mild cases should be kept away from other children. The remedies used are arsenic, especially in the form of Fowler's solution, salicylates and tonics. Sometimes a small quantity of fluid is removed from the spinal canal by a lumbar puncture and a similar amount of the patient's own serum is injected in its place.

MENTAL DISEASES

Psychoses or mental diseases are a group of diseases characterized by a disturbance in the mental function of the brain. The study of these diseases constitutes a special branch of medicine known as psychiatry. It is beyond the scope of this book to describe the mental diseases in detail. We shall merely mention briefly the essential features of some of the diseases which the nurse will encounter in general practice.

Cause: Mental diseases are sometimes caused by organic diseases of the brain such as arteriosclerosis or infections, when these diseases affect the centers for mental functions. The cause of most of the mental diseases however is at present unknown, but there is no doubt that heredity and a constitutional predisposition are important causative factors.

Clinical Forms: Mental diseases may be classified according to the cause as infectious, toxic, alcoholic, or arteriosclerotic psychoses.

They may also be classified according to the age of the patient or associated condition, as Dementia Præcox, Senile Psychosis, or Menopause Psychosis.

The diseases are frequently described by their principal symptoms as Mania, Melancholia, Paranoia, etc. In many cases however these symptoms may occur together or different symptoms may occur at various times in the same disease.

POST INFECTIOUS PSYCHOSIS

Post infectious psychosis is a group of mental symptoms which sometimes follows infectious diseases, such as sleeping sickness,

or typhoid fever. They are probably due to an actual infection of mental centers in the brain.

Symptoms: The symptoms are usually temporary and are principally hallucinations and delirium, failure to recognize objects or people about them, sometimes associated with disorientation; inability to appreciate time and place. If the condition persists typical mania develops. Occasionally depression and even melancholia follow some infections.

ALCOHOLIC PSYCHOSIS

Alcoholic psychosis is a form of toxic mental disease caused by excessive use of alcohol. It occurs in two forms:

1. Delirium Tremens
2. Korsakoff's Psychosis

Delirium Tremens: This is a form of delirium which occurs in habitual drinkers when they suffer from an acute infectious disease such as pneumonia. It also follows an injury or a surgical operation.

The principal symptoms are sleeplessness, violent delirium and hallucinations. The patient frequently sees various animals such as rats, snakes or insects about the room or he may feel them creeping upon him.

The mental symptoms are associated with tremor of the hands and tongue, stuttering, coarse speech, staggering, and a rapid pulse.

Korsakoff's Psychosis: This is a form of alcoholic psychosis which occurs especially in periodic drinkers. It often begins with delirium and is followed by the symptoms of disorientation of time and place and loss of memory. The patient is unaware of the day, week or month and believes he is in a different place or time. The mental symptoms are associated with a multiple neuritis which causes paralysis of the hands and feet.

Treatment: The disease is treated by washing out the stomach and colon irrigations. Sometimes intravenous injections of sodium bicarbonate are given. The delirium is treated by restraint and various sedatives such as bromides, luminal and paraldehyde. The multiple neuritis is treated by massage and electricity.

SENILE PSYCHOSIS

Senile psychosis or Senile Dementia is a mental disease of old age.

The disease is due to arteriosclerosis of the brain or progressive degeneration of the brain incident to old age. It is usually associated with other evidences of arteriosclerosis of the brain and its complications, such as paralysis, or hemiplegia, etc.

Symptoms: The symptoms are variable. The patient has fits of temper and becomes suspicious of everyone, resents interference with his authority, and often believes members of the family are conspiring against him. Sleeplessness and temporary delirium are common symptoms. Gradually loss of memory and inability to appreciate time and place develops, and sometimes mental confusion. The severe cases often develop progressive mental deterioration.

The mild cases are treated by the usual remedies for arteriosclerosis and the severe cases may have to be confined to institutions for the insane.

DEMENTIA PRÆCOX

Dementia Præcox or precocious insanity is a form of insanity which occurs in young people during adolescence.

The disease develops especially in introspective self centered boys and girls who have an hereditary disposition to insanity.

Symptoms: The symptoms are chiefly lack of coördination of mental processes, and emotional and other reactions entirely out of proportion to the cause.

The mental symptoms are variable, but the most common ones are emotional symptoms, negativism, catatonia and paranoid ideas.

The emotional symptoms are spells of crying or laughing at the slightest provocation, or other unwarranted emotional expression. Negativism is a condition characterized by absolute refusal or objection to follow any suggestion. The patient sometimes refuses to take food or to sit down or to walk around, etc. Catatonia is the maintenance of an uncomfortable position or posture for a long time. The patient may stand for hours with the arms extended or keep a leg or arm in an elevated position for hours.

Paranoid symptoms are more or less systematized delusions. The patient believes that people are plotting against him, that he is being persecuted, or voices are calling him, etc. He reacts to these delusions by cutting the telephone wires to stop the voices or in other ways. He sometimes attempts to protect himself against his enemies, or to kill a supposed enemy.

Some cases of dementia præcox improve while others remain hopelessly insane. The disease is usually treated in special institutions for the insane.

MANIC DEPRESSIVE INSANITY

Manic depressive insanity is a form of psychosis characterized by mania or melancholia.

Cause: The cause of the disease is unknown. It sometimes occurs after pregnancy or at the menopause. The latter form is sometimes called Menopause psychosis.

SYMPTOMS

The symptoms are attacks of mania or melancholia or alternating attacks of both.

Mania: The attack of mania is characterized by marked excitement. The patient talks almost incessantly, changing the topic constantly and moves about continuously. In many cases the excitement is the result of definite ideas. The patient believes that she has committed an injury or a crime or an unpardonable sin and talks continuously about the sins she has committed or persons who have plotted against her.

Melancholia: Melancholia is a state of intense depression. The patient refuses to eat, becomes disinterested in herself and her surroundings and everything about her. She sometimes refuses to talk or to answer questions. Suicidal attempts are common.

Course: The attacks of mania are of relatively short duration but an attack of melancholia may last for months or years. As a rule the attacks subside and during the free intervals the patient is normal; but recurrences are common.

Treatment: The disease is usually treated in hospitals for the insane. The attacks of mania are treated by continuous warm baths and sedatives. The melancholia patients however must be watched constantly to prevent suicide.

PARANOIA

Paranoia or monomania is a form of mental disease characterized by definite systematized delusions which have no basis in fact. The patient is perfectly normal but he is insane on one topic.

The disease is sometimes described according to the nature of the delusion, as religious or inventive paranoia. Systematized delusions also occur in other forms of mental disease and are called paranoid symptoms.

Symptoms: The chief symptoms of the disease are usually systematized delusions. The patient has an idea that he is a great religious prophet or musician or inventor. He can give apparently logical explanations to prove his contentions. When the subject of the delusions is not discussed the patient is perfectly normal and gives no evidence of the disease. He is usually a very intelligent and sometimes an interesting person.

Sometimes a paranoiac becomes dangerous because he believes he has a mission to rid the world of a supposedly tyrannical king or president.

The patient is usually kept in institutions for the insane and treated by the usual methods for psychoses.

MENTAL DEFICIENCY

Mental deficiency or amentia is a condition characterized by retardation of all mental processes and intelligence.

Cause: The condition is sometimes a symptom of diseases of the ductless glands especially cretinism. The cause in other cases is unknown but it sometimes follows an injury to the skull at birth.

Symptoms

The chief symptoms are failure to learn at school and to perform simple mental processes. The children frequently learn bad habits and develop emotional and moral instability. The condition is frequently associated with various physical defects.

The mentality of the patient is determined by various intelligence tests such as the Binet Simon or Sanford test. The tests consist of obtaining answers to various standard questions or observing the manner in which the child performs certain simple procedures. These are compared with the results obtained in a normal child. The Intelligence Quotient or I. Q. is then determined by comparing the age of the child with the age of a normal child who usually gives such answers, or performs the procedures in the same way.

According to the intelligence tests mental deficiency is divided into three groups as follows:

1. Idiots
2. Imbeciles
3. Morons.

Idiots are persons who cannot perform the simplest mental functions. They cannot even be tested by intelligence tests.

Imbeciles can perform the simplest mental processes of a child half its own age.

Morons are persons who may be stupid or apparently normal, but their mental deficiency can only be recognized by various mental tests. They frequently constitute the cases of juvenile delinquency and many of them become criminals.

Treatment: The treatment of mental deficiency depends on the cause. If it is due to cretinism brilliant results are obtained by the continued and intensive use of thyroid extracts. In most instances however specific causes cannot be found and the patient has to be confined in special institutions and educated by special methods.

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